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USSR Report

ENERGY

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CONTENTS

FUELS

OIL AND GAS

COAL

ELECTRIC POWER

NUCLEAR POWER

NON-NUCLEAR POWER

PIPELINES

COMPRESSOR STATIONS

ENERGY CONSERVATION

GENERAL

OIL AND GAS

CENTRAL ASIAN OILFIELD WORKERS CALLED TO RESCUE TYUMEN

Baku VYSHKA in Russian 15 Feb 85 p 1

[Interview with Akif Allakhyarovich Dzhafarov, General Director of the Azneft Association, by R. Kender: "To Siberia to Work!"; date and place not given]

[Text] In the offices and hallways of the Azneft Association one now sees warmly dressed oilfield workers wearing sheepskin coats and hats with earflaps and carrying suitcases. They are getting their papers in order. Their destination is a distant one, several thousand kilometers away, in the oilfields of northern Siberia. They will be working there for several months.

As is well known, the Politburo of the CPSU Central Committee backed an initiative put forward by the Tatar and Bashkirian Oblast Party Committees to lend assistance to Tyumen oilfield workers, who have not been able to meet production plans of late. Oilfield workers from all parts of the country have responded to the patriotic initiative. Since mid-January, oilfield workers from our republic have been sending entire brigades and even shops to help the Siberians. The other day, A. Dzhafarov, Azneft Association general director, returned from Nizhnevartovsk, where he had gone to determine how much work must be done. He reviewed the working facilities set up for the personnel. Akif Allakhyarovich [Dzhafarov] answers some of our questions below:

[Question] What is the strategy of the assistance being offered by the Azneft Association? Where are our people going to be working?

[Answer] Several hundred wells which have stopped flowing are standing idle in the Northern oilfields. This is a natural and inevitable phenomenon. It happened in Azerbaijan, too, at this stage. But our oilfields are several hundred times smaller, and we ourselves were able to convert production from natural flow to pumping operations. It is a different situation in Siberia, with an area of a thousand square kilometers, severe climatic conditions and an enormous number of wells. Working over, reconnecting and equipping several thousand wells with mechanized fuel supply seems like taking on the whole world. Oilfield workers from Groznyy, Kuybyshev, Kazakhstan, Turkmenia, the Ukraine and Uzbekistan, literally from every part of the country, have "landed reinforcement troops" to assist the Siberians. What else could be done? Every well drilled is an expensive and complex engineering undertaking. Every well must recoup its cost and produce oil, not stand idle.

We have committed ourselves to restore to operating condition 600 wells belonging to the Nizhnevartovskneftegaz Association.

Workers representing 35 professions have already been sent, including downhole and well workover technicians, drillers, welders, electricians, machinists, drivers, pipefitters, tractor operators and others. These are highly qualified, experienced workers, graduates of industrial training centers who know how to work expertly and fast. Those who have been sent include experienced experts in downhole and general workovers and geology, standardization and safety engineers, technicians and shop foremen.

In addition to personnel, we are sending equipment: bulldozers, cranes, winches, trucks, welding units, tools and work trailers. In a word, 72 railway flatcars were sent to Nizhnevartovsk in a short period of time. It takes that much equipment and materials to equip 20 of our brigades. When I arrived, 13 flatcars had already come in and been unloaded. Workers were starting to rig up the winches.

Azerbaijanian railway workers and airline personnel were of great assistance to us in effectively transporting personnel and equipment, which is no small task. We thank them!

[Question] How is personnel chosen for assignment to the North?

[Answer] This remote and long-term assignment is a voluntary matter. But there are many who want to go. Communists were the first to approach the local party committees, people with extensive practical and industrial experience, and our best young people, Komsomol members. We are sending front-rank people, those who know how to organize their work and can teach others. You see, at the same time as we are working over the wells, we must also assist the Siberians to acquire experience in mechanized oil production and proper reservoir engineering.

[Question] How many brigades have been put together? Will there be more?

[Answer] Twelve brigades have already begun working in the North and eight more will be formed. Each brigade is structured to work all three shifts. We will also be sending more materials and equipment.

[Question] But you do not have surplus personnel or equipment. How will the Azneft Association manage without its best resources, especially since the land workers fullfilled the plan in January only for the first time in the last five years?

[Answer] Was it easy in the Apsheron oilfields in 1941 when every other worker left for the front? People worked and competed, using the slogan "One quota for ourselves and a second quota for those at the front." And now, in the fortieth year of the Great Victory, when we remember by name those who produced fuel at a critically fateful time for the homeland, we think of our co-workers assigned to Siberia as those who have left for the oil front. Those who remain will work for themselves and for those who are in Siberia. I don't think the people will disappoint us.

[Question] What is the weather like in Nizhnevartovsk? Won't the Siberian cold dampen enthusiasm?

[Answer] Freezing weather: 37°C below zero. Blizzards. Snow, deep drifts. Something that Southerners are not accustomed to. But felt boots, sheepskin coats and fur mittens have been issued to the personnel. You get warm from hard work even in the North. Many of our brigades said they wanted to live at the rig sites so as not to lose time coming and going. The people are psyched up to work intensively, like the Stakhanov shock brigades.

At the CPSU Central Committee's Politburo meeting in November of last year, Comrade K.U. Chernenko pointed out how vital it was to increase oil production and fullfill the tasks set by the plan. Konstantin Ustinovich Chernenko stressed that it was necessary to do everything possible to support the industry and assure consistent progress from the very first days of the new year. The national economy needs Siberian oil.

Azerbaijanian oilfield workers believe that the assistance lent to the Siberians will yield results. Every day we intend to bring 10 to 15 wells on stream so that they can start working for the national economy as soon as possible.

8844
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OIL AND GAS

PROBLEMS WITH CASING, DRILL PIPE INTENSIFY

Moscow EKONOMICHESKAYA GAZETA in Russian No 7, Feb 85 p 15

[Article by V. Komarov, Head Specialist, State Auditing Administration of the USSR State Committee for Material and Technical Supply: "Wasteful Generosity"]

[Excerpts] For Thrift and Economy

[Text] The Ministry of the Oil Industry is one of the largest consumers of oil-field pipe: tubing, casing and drill pipe. Its consumption of pipe runs into the millions of metric tons, so the need for a careful approach toward pipe is obvious. And indeed, in many petroleum-producing organizations, ways of saving pipe are being sought.

An experience of the Krasnodarneftegaz Association is interesting. And this is only one of the developments being jointly undertaken with the All-Union Petroleum Scientific Research Institute. Here casing is made out of drill pipe which has exceeded its service life but is still usable for other applications. The tool joints are removed from both ends of the pipe, the pipe is threaded and made up with couplings. After inspection, the pipe is run into production wells. In this way, 15,000 metric tons of drill pipe was salvaged annually, and the actual savings were almost 600 metric tons.

Drill pipe and other materials are properly stored at tens of warehouses and other facilities at the Krasnodarneftegaz Association. Everywhere there is order which could only be achieved through a painstaking daily effort. V. Koryshev, the assistant director of the Association, has expended considerable energy and effort in this regard.

A. Kichik, director of the Black Sea office of the Association, also deserves commendation. Materials under his responsibility, including pipe, are properly stored and records are in good order.

A detailed daily effort on one hand and the implementation of technology which conserves resources on the other hand, enable the Krasnodarneftegaz Association to effect considerable savings in pipe.

The Tatneft Association is involved in a promising effort to extend pipe service life by lining it with polyethylene. A polyethylene tube is cold drawn through the metal pipe using a special filler, followed by heat treating. Double-layered polyethylene-lined one-piece metal pipe results, combining the chemical stability of polyethylene with the mechanical strength of steel. Its service life is three to four times longer than conventional pipe. Use of plastic-lined pipe makes it possible to save up to 7,000 metric tons of metal annually at a single association.

Unfortunately, however, there is also an abundance of poor practices in the use of oilfield pipe.

The cornerstone of increased savings is the establishment of norms. Several ministries have set themselves the task of reducing average pipe consumption norms. But the Ministry of the Oil Industry has not set itself any such task for oilfield pipe. On the job the effort is not always made to save pipe. Far from it.

In a number of associations, pipe consumption norms are approved at levels above consumption in previous years. Aktyubinskneft has set its casing consumption norm for production drilling at 95.9 kg per foot drilled when actual consumption was 65.3 kg. This defective practice in norms is also in effect at the Grozneft, Azneft, Turkmenneft and Nizhnevartovskneft Associations. Objective difficulties [are invoked] to explain a lot. Such explanations could be accepted if similar errors were not repeated from year to year. But what well-grounded norms can there be in the organizations under Kirgizneft if there is not even any personnel in charge of setting norms and the information on which norms are set comes in irregularly and is unreliable?

Improper norms are also dangerous. When there is surplus pipe, it is wasted. Some managers dispose of State property as if were their own.

A year and a half ago, over 2,000 metric tons of pipe were diverted at the Udmurtneft Association and some 1,000 metric tons at Orenburgneft.

It would be interesting to know where these generous managers are sending scarce pipe. For example, in Orenburg gardeners at the Burevestnik Society got some. And this was done with the Ministry's knowledge.

At Mangyshlakneft, pipe was bartered for desks. The Tadzhikneft Industrial Association sold pipe to a bread association, a food technicum and a knitted garment factory. The range of items accepted in barter was quite large: bags, seed, flasks, brick....

This is what a surplus of pipe leads to! If pipe were subject to proper norms, would the associations use it to pay for automotive services?

The efficient use of resources can be substantially increased by placing unused materials over and above the norm in the economy. But last year pipe stocks over and above the norm at all the associations amounted to no less than 75,000 metric tons. At Udmurtneft, stocks even increased over the year. There was considerable unused pipe at the associations. At Turkmenneft, pipe has been stored unused since 1970.

Some pipe is lost in careless shipping, loading and unloading and improper storage.

The storage and warehouse situation at the Bashneft Association's Neftekamsky facilities can be appreciated by the following fact: the warehouse, whose estimated value exceeds 200,000 rubles, was finished on December 29, 1983, but was not in service as late as the middle of last year. Pipe racks were not even in place. But the managers received their bonuses in full for completion of the project ahead of schedule.

Now the associations' rights to materially encourage efforts to effect savings have been considerably expanded and bonuses have been increased. It is thus rather surprising that enterprises are not rushing to take advantage of the possibilities being offered. The average bonus for saving materials is 87 kopecks per year per employee, while other incentives exceeded 400 rubles. It is interesting to note the list of items for which the Ministry of the Oil Industry pays conservation bonuses includes gasoline, cement, water -- literally everything but oilfield pipe.

Oilfield pipe must be used wisely! Pipe stocks at enterprises under the Ministry of the Oil Industry are large. They should be placed in use as soon as possible.

8844
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OIL AND GAS

NEBIT-DAG FIELD PRODUCTION, PROGRESS STATED

Ashkhabad TURKMENSKAYA ISKRA in Russian 24 Jan 85 p 1

[Article by Kh. Ishanov, head, Nebitdagneft imeni USSR 50th Anniversary Oil and Gas Production Administration: "Policy of Intensification"]

[Excerpts] On New Year's Eve...

[Text] On New Year's Eve the Nebitdagneft imeni USSR 50th anniversary Oil and Gas Production Administration reported its successes: the production of over 38,000 metric tons of oil, which exceeded the plan.

We did not reach the oil production goal for the first quarter of 1984. There was justification: natural reservoir drawdown, winds and blizzards in February and the collapse of transmission line towers, as a result of which a great deal of equipment went out of service. There were other objective reasons, too.

The collective is confident of its own resources. It will find ways to step up production in the future. At the present time, measures are being implemented to utilize waste water to maintain reservoir pressure. A great deal of work will be done in the Nebit-Dag field to increase oil production here. Reworking of the high-voltage lines operating in this region will make it possible to solve the problem of mechanizing all the producing oil wells in the Barga-Gel'mes field. Efforts are continuing at reworking the Burun field and restoring power supply unit No. 8 back to service. Carrying out these efforts are a matter of honor, not only for the Oil and Gas Production Administration collective, but also the workers of the Turkmenneft Association's Construction and Installation Administration, the Vostokneftegazelektromontazh Trust's Nebit-Dag Construction and Installation Administration and of the subdivisions of the Turkmenneftestroy Trust, who must accomplish a great deal of work. Successful fullfillment of our five-year plan for oil production largely depends on their efforts.

8844
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OIL AND GAS

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PREDICTION, PREVENTION OF PRESSURE PROBLEMS IN AZSSR OUTLINED

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 12, Dec 84 pp 11-14

[Article by M. B. Kheirov, of the Azerbaijan Scientific Research and Planning Institute of Petroleum, "The Connections Between the Geological and Lithologico-Petrographic Features of Rocks, and the Complications Which Arise During the Sinking of Deep Wells"]

[Text] In order to predict and prevent the complications which arise in drilling wells, it is critically important to precisely define the connection between the features of the rocks and these complications. Among the factors which effect complication, a region's tectonics hold a special place inasmuch as they determine the paleogeography of a basin's sediment accumulation, the formation of rocks, and their properties [3, 4, 6, 8].

In this connection it should be mentioned that complications find further development in geosynclinal areas than in platforms. In alpine geosynclinal belt regions (Ciscaucasia, the near side of the Carpathians, Azerbaijan, Turkmeniya etc.), complications are encountered almost everywhere at great depths. The complications are associated with AVPoD [abnormally high pore pressures] in the clays, which do not take place within the boundaries of the ancient platforms. Many researchers have noted that the complications are confined to tectonically active areas [1, 2, 5].

Tectonic movements, parallel with the effect on conditions for sediment accumulation and the rocks' strength, lead to geological complications of a different type. Thus, the intensive downwarping of the Southern Caspian basin, which began at the end of the Pontian stage, was accompanied by extremely complicated tectonic processes, which led to the rise of a multitude of discontinuous dislocations of the sedimentary cover, which often cause complications. In the sections which have been subjected to strong tectonic movements, there is observed a considerable consolidation of the rocks with a transition of clays into argillites, which leads to a drastic change in their mechanical properties and the nature of the complications in the sinking of deep wells. As an example, one might use the argillites of the Lower Cretaceous deposits of the Dzharly Nizhnekurinskiy Oblast area, and the Chokrak rocks of the Inchkhe-more area in the Dagestan ASSR. The argillaceous rocks of the Chokrak horizon in the Inchkhe-more area are highly metamorphized. These rocks show up as dark-gray, almost black dense dessicated argillites containing carbonized plant remains. These rocks stand out sharply from the Caspian Sea region-Kubinskiy Oblast deposits, which are made up of plastic clays of the same age.

Thus, there is obviously as much need to study the paleotectonics of areas in which exploratory drilling is being conducted, as there is to study the ongoing tectonics.

A study of the connections between the lithologico-petrographic features of rocks and the complications which arise when drilling wells shows that the latter are confined for the most part to thick young plastic argillaceous sections, and to collectors which have excellent filtration properties [4]. Here, the things which lead to complications when these rocks are drilled are varied. The complications which crop up in clayey rocks are associated with the clays' abnormally high pore pressures, their plasticity, the conditions of their stratal occurrence, their textural, structural and many other features, whereas the complications which come about during the drilling through permeable rocks are connected with the pressure differential and the special lithological features of the collecting rocks.

In order to make reliable predictions of abnormally high pore pressure [AVPoD] in the clays, and AVPD [abnormally high formation pressure] in the collectors, and to prevent the complications associated with these phenomena, it is critically important to determine their nature and the regularity of their distribution in space and time. Numerous works have been devoted to this problem [1-3, 8], and over 30 different hypotheses have been proposed concerning the nature of AVPD and AVPoD, among which the authors of this work [2] single out the following: the gravitational-elision [elizionnyy]; the geodynamic [1]; on the influx of high-pressure deep-seated fluids into hydrodynamically enclosed reservoirs; on the action of various geological factors (the transition of some liquids and rocks into others, temperature change, etc.). In this connection, it should be noted that the emergence of various hypotheses on the nature of AVPoD is no accident, since, in varying geological conditions, varying mechanisms for originating them are possible. The majority of researchers who study sedimentation basins show a preference for the gravitational-elisional hypothesis, which states that AVPoD and AVPD are brought about by the gravitational compacting of sedimentary rocks. In the sedimentary rocks of Azerbaijan, abnormal pressures occur for the most part in accordance with the gravitational-elisional mechanism.

This is corroborated by:

the confinement of AVPoD to young thick plastic argillaceous series;

the fact that AVPoD increases with an increase in plasticity;

the increase of AVPoD with depth and the approach of its values to the overburden pressure resulting from the increase of plastic deformation with depth, and when the stress of the all-round compression reaches ultimate strength;

the confinement of maximum AVPD values to the thin sandstones enclosed between thick clayey series, and the confinement of AVPoD to thick clayey deposits, and the relative increase of AVPoD in the middle part of the clayey section in comparison to the sections which are nearer the sandy-aleurite rocks;

the fact that AVPoD surpasses AVPD;

the rarity of AVPD in ancient platform areas, and its wide propagation in geosynclinal areas (including in the sedimentary rocks of Azerbaijan);

the reduction of AVPoD and the fact that its values approach those of AVPD (as it occurs in the pay section deposits in the Khilly and Neftechala, the Maykopian deposits of the Caspian Sea region-Kubinskiy Oblast, the pay section of the Apsheronian oil and gas region), and in the presence of frequent of clays and collecting rocks, etc.

As fairly noted by B. L. Aleksandrov in his work "Abnormally High Fluid Pressures in the Arenaceous-Argillaceous Sections of the USSR's Oil and Gas Region Profiles," the confinement of structures having AVPD to present-day tectonic regions provides the basis for the belief that the gravitational-elisional and the geodynamic hypotheses are interrelated. This is explained by the fact that tectonically active sections of the earth's crust are characterized by the highest possible subsidence rates or the bulging up of the basin's bottom. In this connection, in the sections having high subsidence rates for the basin floor, the thickness of the deposited sediments is greatest, and on the other hand, the greatest amount of dispersion material which leads to their under-compaction, and as a result of this, to AVPoD formation, which promoted the AVPD. In this connection, the factors which promote increased AVPoD are all those which are favorable to increasing plasticity: high sediment accumulation rates; relatively young age; the presence of minerals capable of swelling; increased moisture; an abundance of organic colloids; high rock dispersion; low mineralization of the interstitial waters; a high dielectric constant; high porosity and low density; defects in the crystals etc.

The presence of excellent fluid barriers is essential to the maintenance of AVPD. At a porosity coefficient of $C_{po}=0.5\cdot10^{-21}$ m^2 and with no influx of liquid from below, the AVPD is maintained for no longer than 10 million years. In this connection, it should be mentioned at shallower depths, where poorly permeable argillaceous surfaces have not yet been formed, it is impossible for AVPD to occur. Maintenance of AVPD is also highly improbable at extreme depths. That is why, for each area, taken individually, depending on the geological-lithological conditions, there is a specific optimal depth at which AVPD occurs and is maintained. In individual sections of the Kurinskiy Oblast area and the Baku Archipelago AVPD's can be maintained at depths of up to 7-8 km, since the thick plastic, and relatively young argillaceous series here are widely propagated, in the fine clay fractions of which montmorillonite comprises the predominant ingredient. At these depths, other argillaceous minerals also become plastic and encourage the preservation of the AVPD's. At great depths, the phase composition of the clays exerts no noticeable influence on AVPD preservation. It has a marked effect on the degree of AVPoD in the relatively young clays which have undergone catagenetic alterations, and which occur at minor depths (up to 3-4 km).

The following can be used to predict AVPoD and AVPD and to prevent the complications associated with them:

charts showing the connections between the coefficient of abnormality of the interstitial water in the clays with the rate of sediment accumulation (for this, we would need to have maps of the thickness distribution of the relatively young deposits);

lithologic features of the rocks, and the extent of their catagenetic alteration;

the composition of the rocks, their structural and textural peculiarities, and the composition and structural features of the minerals comprising them;

the character of the alternation of the varying lithological types of rocks;

the diminution of the specific electrical resistance of the argillaceous rocks above the stratum of a collector having AVPD's;

a 2-4-fold increase in drilling speeds when approaching oil and gas reservoirs with AVPD;

the increase of formation temperature;

the increase in porosity of argillaceous surface rocks.

Here, one must proceed from the fact that each region, with respect to its age, the rate at which sediments have been accumulated, the mineralogical composition of its clays, the geothermal situation and the history of its geological development, has its own conditions of rock consolidation and density curves.

In contrast to the complications associated with AVPoD in argillaceous rocks, the primary reason for the seizure of drill tools in sandy-aleuritic rocks is the difference between the hydrostatic pressure in the borehole and the formation pressure (the pressure differential). In the presence of high pressure differential values, there occurs an ingress of the drilling mud filtrate into the formation, and the thickness of the clay crust increases on the wall of the borehole, which results in the drying out of the borehole. This, in turn, leads to the seizure of the drill tool. If the collector turns out to be uniform, then the crust's thickness will increase uniformly from all sides, since the rate of ingress of the filtrate into the formation will be constant. Otherwise, the rate at which the filtrate enters the formation will be greater on one side than on the other. This will lead to a nonuniform increase, from various directions, in the growth of the crust. Here, the pressure on the tool will be less from the side where the crust is rapidly increasing, and the tool ends up being pressed against this very wall.

Research into the connection between drill-tool sticking and the pressure differential based on data from well drilled in the Baku Archipelago [7] has revealed that in order to predict and prevent complications in time, in addition to making use of the previously collected detailed geological, lithologico-petrographical, petrophysical, and other of the rocks' parameters applicable to drilling, the data obtained during the sinking of wells should be used.

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OIL AND GAS

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SANGACHALY-MORE--DUVANNYY-MORE--BULLA ISLAND FIELD OUTLINED

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 12, Dec 84 pp 6-10

[Article by A. A. Narimanov and O. G. Badalov of the Caspian Sea Oil and Gas Industry All-Union Association,"The Prospects for the Presence of Oil and Gas in the Southwestern Part of the Sangachaly-more--Duvannyy-more--Bulla Island Field"]

[Text] Oil explorations in the Sangachaly-More--Duvannyy-more--Bulla Island oil and gas-condensate field were begun in 1950, but in spite of the fact that exploratory operations were initially conducted more vigorously in the field's southwestern part, its oil and gas saturation was not established until 1975, when, from Well No 542 on Bulla Island, an inflow of oil was obtained during the development of section V of the PT [pay zone] horizon [1]. Through continued efforts, the oil and gas saturation of the V horizon was confirmed (Well No 553), and an oil reservoir with a gas cap was found at the VII horizon (wells No 554, 557, 568 and 555).

We made an attempt to outline the most promising directions for a continued search for oil and gas accumulations in this area. With this goal in mind, all the geological and geophysical data which had been accumulated was critically analysed and correlated. This encompassed the material for the southwestern part of the Sangachaly-more, Duvannyy-more, Bulla Island areas, and also adjacent areas of Dashgil, Alyaty-more and Bulla-more.

The boundary between thre VII sandy-aleuritic horizon and the NKG [Nadkirmak argillaceous] suite's PT [pay section] was used as a single precise reference point for the entire area of the limb, and was also used in making up the block diagram (Figure). In determining the area's oil and gas content outlook, the overall characteristics of its paleogeographic situation, with regard to sediment accumulation in the time period under consideration were examined as well as the special features of the pay section's sediment areals of the varied types of facies which have developed here, i.e., the Apsheronian and the Alyat-Pirsagatian, and this was also used as the basis for separating this section's zones into those which are promising and those which hold little promise [2].

In simplified form, the southwestern part of the field (without the transverse dislocations), and in only the Sangachaly-more area, has the characteristic

form of a brachyanticlinal limb. In the rest of the area we observe a fairly steep (up to 20°) monoclinal filding of the horizon with a hypsometric submersion of up to 2000 m, which goes from the Duvanny-more area to the Bulla Island area. The similar underdevelopment of one of the limbs of the anticline is peculiar to the structures near the fault [3].

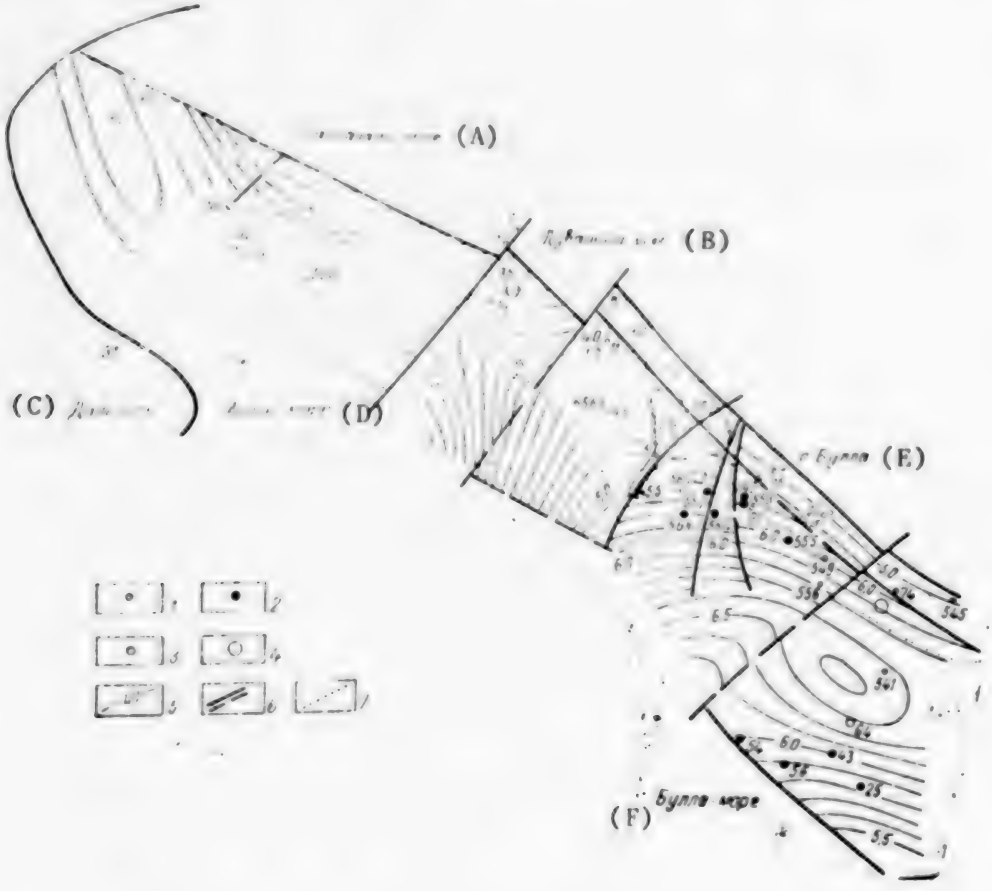

Figure.
Key: 1,2,3,4--drilled well, respectively; those which produced oil or gas; undergoing drilling and recommended; 5--isolines along the base of the VII horizon of the pay section; 6--known and probable faults; 7--probable reservoir contour; (A) Sangachaly-more; (B) Duvannyy-more; (C) Dashgil; (D) Alyaty-more; (E) Bulla Island; (F) Bulla-more

On the Sangachaly-more--Bulla Island structure, according to the aggregate drilling and seismic survey data, there is a second southwesterly longitudinal fracture which is separated along with the main axial fracture. If the majority of researchers have no doubt about the presence of a subparallel longitudinal fracture in the Sangachaly-more and Duvanny-more areas, then there is no united opinion concerning its track within the Bulla Island area. Analysis of all the geological-geophysical and field data has made it possible [4,5] to trace the spatial strike of the second fracture in the Bulla Island area. The amplitude of the vertical displacement of the strata along this fracture, in

the section reliably exposed through drilling, is small (about 150 m) relative to the overall displacement along the fractures of the northeastern and southwestern blocks (which are on the order of 1,800 m).

According to our data, the second longitudinal fracture inclines to the northeast and has been accurately traced in the upper strata all the way up to the modern. The fracture has subordinate significance, was caused by the development of the main longitudinal fracture, and originated as the result of the tectonic stress forces being relaxed at the edge of the tectonic field which was carried away in the downwarping (subsidence) process, evidently as a result of the shoving of the foundation blocks. The tectonic block enclosed between the faults is sharply pitched and is characterized by angles of dip of up to 30-40°, then, as in the stable bedding beyond the second fault, the strata have angles of dip of 10-20°. Thus, if an angle of 12-14° was recorded (in the 1,545-1,552 m interval) in Well No 545 in the upper interval of the pay section near the crest, then with depth it gradually increased to 40° in the 3,876-3,880 m interval, to 50° (in the 4,455-4,460 m interval) and 62° (in the 4,701-4,706 m interval), with slickensides observed in the cores samples. It should be mentioned that the borehole of this well has a 6-7° deviation in the dip azimuth of the strata, i.e., the true angle of dip of the strata which the well sinks through is less by 6-7°.

In Well No 555, angles of 42° were recorded in the core samples taken from a depth of 3,814-3,819 and 4,595-4,604 m, and the samples taken from 5,254-5,258 m, showed that the angles had already changed to 22-24° (a correction being needed in the direction of the reduction, due to the borehole deviation in the dip azimuth of the stratain the dip azimuth of the strata by 4-5°), and here slickensides were noted in the core samples with the steep angles. The slickensides were traces of tectonic movement. This fact shows in graphic fashion that the well was initially drilled in a block between two longitudinal ruptures, and somewhere in the 4,604-5,254 m interval it intersected a fracture and entered a block with stably resting strata. By the way, in e core samples taken from the 5,567-5,570 and 5,990-5,994 m intervals, the angles of dip were 15-20°.

The position of the extended cross fault on the level of the VII horizon's pay section has been confirmed and defined more exactly in the present work. This fault has already [2,4] been detected and described as occuring along the Late Pliocene deposits within the southeast perecline of the Sangachaly-Bulla sructure. This became possible after additional drilling data were obtained in the southwestern (Well No 556), as well as the northeastern (Well No 570) parts of the Bulla Island area. The fracture is inclined to the southeast. The true extent of its amplitude has been distorted in connection with the apparent horizontal displacement of the northwestern tectonic field to the southwest, with regard to the opposite field. This displacement has been accurately recorded with respect to the young deposits and the Akchagyl bottom as amounting to approximately 500 m.

In addition to this transverse dislocation we have detected, in the Bulla Island area, three radially oriented fractures which have come, in our opinion,

from the vicinity of an active mud volcano. The amplitude of the vertical displacement of the strata along the fracture between Wells No 563 and 569 amounts to 400 m, and reaches 150-180 m along the two others. The faults are sharply upthrust and give part of the area a stepped appearance: each successive southeastern block is lower.

It needs to be mentioned that the block under Wells No 563 and 18 is somewhat artificially isolated by radial and longitudinal faults which have been traced from the Alyaty-more area. This isolation is primarily associated with the persistence of the radial fault's amplitude. The possibility that this transverse fault extends further to the southeast has not been ruled out.

The next transverse fault lying on a northwestern track, and isolating Duvannyy-more Well No 563 and Alyaty-more Well No 6 has been conditionally detected in connection with indications (clearly shown on MOV [reflected wave method] seismic profiling) of the horizontal displacement of the dislocated crest area in the in the Duvannyy-more area. There is practically no visible vertical displacement of the blocks along the dislocation (and this is probably due to the horizontal displacement). The next transverse dislocation, which separates the block with Sangachaly-more Well No 14 has a narrow amplitude (about 100 m), but is more positively separated. The dislocation, in all probability, has an extended character.

Another short transverse dislocation which has a narrow amplitude (25 m) has been distinguished with regard to its seismograms in the crest area in the Sangachaly-more area. However, it has no practical significance regarding possible hydrocarbon distribution. (The faults which have been detected will be defined more precisely in the course of subsequent exploration-prospecting and field operations. As far as obtaining additional geological-geophysical information, the fractured tectonics of the area are also to be detailed.

In accordance with our data on the structure of the southwestern part of the field under investigation, its outlook with regard to the presence of oil and gas depends a lot on the discontinuous tectonics. At the same time, the lithologico-facial factor, which in the first place implies the nature of the structure and the extent of the collectors and the fluid barriers, is critically important. The surfaces of the known oil and gas reservoirs in the Baku Archipelago, as well as for the entire Southern Caspian basin, are comprised of argillaceous plastic rock, which possesses excellent insulating qualities. In this regard, the southwestern part of the Sangachaly-more--Duvannyy-more--Bulla Island Field is no exception.

Analysis and correaelation of well logs permits certain observations to be made concerning the presence of collectors and their spatial distribution.

In the first place, it should be mentioned that the Baku Archipelago's prospects for the presence of oil and gas are associated for the most part with the VII and VIII horizons and the pay section's PK [not further expanded] suite, which are all made up of frequently poorly compacted silty sandstones. In character, they are related to the Ashperonian type. The range of the

Middle Pliocene sediments from this time struck within the northern part of the Baku Archipelago, but had differing boundaries. Sediments of the VII horizon (a break suite) were the most widely distributed [6].

In the area under investigation, in a northwesterly direction, it has been noted that the Apsheronian sediments have either diminished or have been completely replaced by Alyat-Pirsagatian sediments, i.e., an argillization of the section is occurring. In the wells which have exposed the entire pay section profile, a band of poorly-sorted varieties, relating to the PK section, has been noted in its bottom part.

In the Sangachaly-more area, the PK suite profile is markedly argillized, and the rare (1-2) thin (up to 5 m) near-impermeable strata which have been detected are not interesting enough to be explored for commercial oil and gas accumulations. The permeability of the PK suite profile improves toward the Duvannyy-more area. In Well No 563 the PK suite is comprised of a permeable member, up to 40 m thick. In the bottom area, a 7-meter high-resistance (up to 14 Om·m on a background of 2 Om·m) stratum has been detected. While completing the well following perforation of the 4,995-4,978 m interval, a strong inflow (up to 600 m^3/day through an 18-mm flow bean) of sulfate-sodium water was obtained, with no oil or gas indications. This attests to the presence in the PK suite profile of excellent collectors which are capable, in favorable conditions, of holding commercial oil and gas accumulations. In the Bulla Island area, in connection with the probable improvement in the sorting of the PK suite's sandy material, its profile is expected to be more permeable. The suite's thickness could increase to up to 50 m.

In the Kirmak suite (KS) profile there are no strata capable of acting as individual objectives of oil and gas exploration. However, in the Bulla Island area the KS deposits should be considered as possible research sites for an oil and gas inflow from the wells being drilled into the PK suite. By the way, in Well No 563, in the 4,858-4,838 interval of the KS, two 7-meter strata were encountered. After perforating at 1-meter intervals at depths of 4,857, 4,854 and 4,841 m, an inflow of hydrocarbonate sodium water was obtained, which had a yield of of 50 m^3/day.

The VIII horizon pay section (similar to the Apsheronian NKP suite), in the area under study, was sunk through by a number of wells in the Sangachaly-more and Duvannyy-more areas, wherein it has been segregated purely conditionally, since it shows up primarily in an argillaceous lithofacies. In the Bulla-more area, the NKP suite was exposed by Well No 56, and within its profile only a single 9-meter stratum has been found which has excellent permeability. As the well was being completed an inflow of gas was obtained from the 6,097-6,088 meter interval, which yielded 850,000 m^3, and an oil-condensate mixture which yielded up to 300 tons/day through 16- and 18-mm chokes at r_{buffer}=24.8 MPa.

Using the information presented thus far about the areal of the suite's sediments [6], it can be suggested that the productive reservoir thickness of the suite in the Bulla Island area amounts to 8-10 m in the vicinity of Well No 554 and 564, and up to 20 m in the southeastern area (the thickness of the sandy suite in the northeastern part of the field is about 60 m). In passing, allow us to mention that for this exact reason, the section of the VIII horizon in the Alyaty-more area will turn out to be comprised of a clayey lithofacies which is incapable of acting as a receptacle for the accumulation of oil and/or gas.

The thickness of the VII horizon in the area being studied increases from 65-75 m in the northwest (Sangachaly-more Well NO 19, Alyaty-more Well No 4 and Dashgil Well No 31) to 110 m in the Duvannyy-more area, 120 m in the Bulla Island area and 135 m in the extreme northeast (Well No 541). In this same direction, i.e., from the northwest to the southeast, the sandiness of the horizon's profile increases, the sorting of the sandy material improves, and the clayiness is reduced. In the Sangachaly-more area and the northern part of the Alyaty-more area the horizon section is represented by frequent alternation of thin sandy and clayey differences which evidently which are evidently new in the area.

The lithofacial substitution of the clays by sands and sandstones has brought about the occurrence of uniformly thick (up to 10-20 m) sandy intercalations possessing excellent capacity parameters. Suffice it to say that during the completion of perimeter well No 563 and Well No 555, which was an edge well in the area, a high-pressure inflow of up to 500 m^3/day of liquid was obtained.

With regard to its extent and definition, the V horizon of the pay section is quite similar to the VII horizon. The thickness of the horizon in the region where it developed (Bulla Island) has increased to 140 m.

Thus, it is obvious that the degree to which the southwestern part of the Sangachaly-more--Duvannyy-more--Bulla Island Field looks promising depends, in the first place, on tectonic and lithofacial factors.

On the whole, in accordance with our notions on the geological structure of the part of the field under investigation, with regard to the potential resources, the southwestern part is many times inferior to the northeastern part. The known and potential reservoirs here cannot possess unified outlines and have a limited character. The type of reservoirs which were expected are tectonically screened.

We have conditionally broken up the southwestern part of the field into four separate fields, the prospects for which are dissimilar.

In the first field (see Figure), only the profile of the VII horizon in the crest band of the limb evokes any interest from the standpoint of oil and gas exploration. The question of the presence here of oil and gas reservoirs by locating a single exploratory well 1,800 m northwest of Well No 27, with a projected depth of 2,900 m.

In the second field, the prospects for the presence of oil and gas are connected with small tectonic traps in the area of Well No 11, which has been drilled less than called for by the plan, and in the Well No 14 block. Any possible reservoirs here are associated with the collectors of the VII horizon and the PK suite, and cannot be very large.

The third field's prospects are associated with the supplementary exploration of pools in the V and VII horizons, the detection of the presence of oil and gas in the PK suite's profile, and the establishment of the presence and possible productivity of the VIII horizon. This last problem should be solved in passing, in an exploratory well, which we suggest be sunk into the PK suite in the vicinity of Well No 569, which is being drilled in the VIII horizon.

In the fourth field all the sandy-aleurite horizons and pay sections suites look promising. However, in the absence of an extended transverse fault, possible reservoirs will be controlled by trap closure along the 6,150 m isoline, that is, the reservoirs' elevation does not exceed 200 m at its highest. The oil and gas saturation of the pay section collectors up to the PK suite inclusively, can be cleared up by an exploratory well with a projected depth of 6,750 m, and sunk 1,700 m to the north of Well No 541.

Thus, for the most trustworthy answer to the question on the commercial oil and gas presence of the entire pay section profile in the southwest part of the Sangachaly-more--Duvannyy-more--Bulla Island field, in addition to Bulla-more Well No 64 and Bulla Island Well No 569, it should suffice to sink five exploratory wells, and the supplementary exploration of known reservoirs can be taken care of by producing wells.

In the southwestern part of the field, the maximum possible increase of reserves of total hydrocarbons (not counting the variable of the complete fullness of the fourth field) within the outlines shown in the figure, will amount to millions of tons.

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12659
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OIL AND GAS

GASLIFT CRITICAL TO SAVE TYUMEN'

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 2 Mar 85 p 2

[Article by V. Borodin, manager of the Oil and Gas Industry and Geology Section of the newspaper, TYUMENSKAYA PRAVDA: "The Oil Formation's Reserves"]

> [Text] Tyumen Oblast's share of the crude we recover is substantial. However, the enormous production potential of the West Siberian Oil and Gas Complex which the country's entire efforts have created still is not being used fully. For a third year, Glavtyumenneftegaz [Main Administration of the Oil and Gas Industry of Tyumen Oblast] subunits have not coped with the plan.
>
> A deep analysis of the state of affairs in the region's oil industry was given at a recently convened plenum of the Tyumen Oblast party committee. In speaking at the plenum, CPSU Central Committee Politburo Candidate Member and CPSU Central Committee Secretary V. I. Dolgikh noted that the worsening of the work of the oblast's oil-recovery enterprises, at a time when oil gushers are becoming fewer and recovery is increasingly difficult, is explained to a great extent by the fact that the time for the responsive solution of questions which had come to a head had slipped by.

The conversion of wells at the Tyumen oilfields to mechanized recovery methods has become a most severe problem today, it was emphasized at the oblast party-committee plenum. Specialists consider the so-called gaslift method to be one of the most promising recovery methods. It is one well known to every superintendent: it is an ordinary siphon. The operating principle is related: liquid is ejected from a container by a gas. In order to force the oil out when reservoir energy is no longer adequate, it has to be extracted from the depths by pumping jacks or electrical centrifugal pumps, which are not noted for reliability, unfortunately. From time to time wells must be shut down and the pumps changed and repaired. A whole army of repair workers is engaged in this in West Siberia.

The gas "elevator" does not require that complicated equipment be lowered into the well. Operating time of the recovery capacity between repairs is increased severalfold and losses of crude are reduced.

The first gaslift complex in the region was constructed back at the start of the 1970's at the Pravdinskoye field, and it proved convincingly its superiority over other mechanized recovery measures. It was decided to erect such complexes at the Samotlor and Fedorovskoye fields, and, in the future, at the Varyegansk and other Tyumen fields.

However, the new method is being adapted slowly to the Tyumen fields. It was proposed to bring primarily the Samotlor and Fedorovskoye complexes up to design capacity in the middle of last year. But it did not happen. At Samotlor, for example, almost one and a half thousand wells have not been converted to gaslift--more than half of those planned. This could not help but tell on the overall work results of Tyumen oilfield workers, who last year fell short more than 9 million tons of valuable output for the country.

It was stated at the CPSU oblast committee plenum that deficiencies in the oil-recovery workers' operations was caused to a great extent by the lag in the buildup of the oilfield's facilities. This factor very likely affected sharply introduction of the gaslift method. The design called for 14 compressor stations, more than 2,000 km of high-pressure gas pipeline, and more than 800 km of remote-control lines to be constructed and put into operation by the middle of 1984, and more than 4,000 wells were to be connected to the system.

While almost all the compressor stations, the largest of the facilities named, are operating, today only half, or even less, of the complex's remaining components have been built. In regard to the pipelines, for example, the program has been fulfilled by only one-third. What happened to Samotlortruboprovodstroy [Samotlor Pipeline Construction Trust], once an advanced trust?

There is no secret here. Previously it participated in the erection of trunk oil and gas pipelines, whose cost is much higher than that of present-day oilfield arteries. During the short winter period the collective succeeded in fulfilling almost the annual volume of construction and installing work, in monetary terms. Now it must occupy itself with the "noodles," as the pipeline-route workers call the small-diameter pipe. The labor intensiveness of all operations has risen sharply, and earnings have been reduced. Highly qualified welders have left to build large underground trunk pipelines.

It was necessary to raise sharply the productivity of the brigades, to reequip them with machinery and to convert them to round-the-year erection of pipelines. But the builders turned out not to be ready for this.

Right now Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] is taking extreme measures: people are being brought in, and machinery is being transferred here from other parts of the country, in order to make greater progress during the winter. But one must not forget "about afterwards" and a strengthening of Samotlortruboprovodstroy itself.

If pipeline specialists cannot cope with the "noodles," then what is to be said about the builders and oilfield workers to whom "vermicelli" has been shipped--small branches from the gas pipelines to the cluster sites--and about the buildup of the well facilities themselves? But even so, last year Zapsibneftestroy [West Siberian Association for the Construction of Oilfield Facilities] brigades almost stayed within the program. Industrialized construction methods helped.

However, it will not be easy to wipe out the arrears that have been built up. It is necessary, as a minimum, to double the work pace, in order to master the amounts called for by the design's first phase. But often the clients, the oil and gas recovery administrations, fail them. They are very late in sending the design papers for building up the cluster wells' gaslift facilities. At the start of last year the Belozerneft' NGDU [Oil and Gas Recovery Administration] delivered only one-seventh of the designs for the annual program to the builders.

Minnefteprom [Ministry of Petroleum Industry] plants delayed the transmittal of connecting parts by half a year. Minkhimmash [Ministry of Chemical and Petroleum Machine Building] could not for many years master the output of the shutoff fixtures for the new method for recovering oil. Nizhnevartovskneftestroy [Nizhnevartovsk Trust for the Construction of Oilfield Facilities] specialists figured that if the installers are provided with everything that is necessary, they will be able to fit 700 Samotlor wells with gaslift facilities in a year--almost double what has been managed to date.

Even the reliability of gaslift-complex functioning disturbs oilfield-facility workers. Here is a rather typical situation.

It is Samotlor, gaslift station No 10-20. The telephone on the desk of V. Gorodnichiy, chief of the gas-compressing department, rings.

"The compressor has stopped again!" a neighboring department of the Belozerneft' recovery administration reported. "Take quick measures. Because of you, we will be short thousands of tons of oil."

"It was not our fault the unit stopped. The oil-preparation and repumping department splashed liquid into the pipe along with the gas...."

Such telephone squabbles are an ordinary matter at Siberian oilfield installations where the new oil-recovery method is being introduced. According to Glavtyumenneftegaz data, stoppages for this reason occur an average of about twice per month, and if electrical blackouts and other factors are also counted, then it turns out that each day the machinery comes to a standstill at one station or another.

"To punish the guilty would require calling a commission and preparing a report each time. But then the compressors would be idle for hours. Given the daily amounts of recovery, these losses would be too great," says V. Gorodnichiy.

The meaning of this lack of coordination is that a progressive innovation is being poorly melded into the traditional technological and organizational scheme. At the Samotlor and Fedorovskoye fields, it is becoming more complicated each year to extract the crude. It has to be squeezed out and flushed from the ground with water. It is natural that the content of the liquid has increased in the wells' product. But the units installed at gaslift stations are not supposed to transfer water, or even wet gas.

Is it possible somehow to deal with the treacherous moisture? It can be done. There is, in particular, an original development of the Nizhnevartovsk engineers, which was carried out in collaboration with Krasnodar specialists. At

the Leipzig Fair their vertical centrifugal separator was recognized with a gold medal in 1982.

There is recognition. And there is even a report of acceptance tests of 30 October 1981 signed by V. Gnatchenko, chief of Minnefteprom's Administration for Oil and Gas Recovery, which recommended initiation of industrial production of the innovation. However, Glavtyumenneftegaz's Neftemash Plant produced only four test models. It is not known when series production will start. But Samotlor cannot wait. The Tyumen fields should be assimilated on the basis of progressive technical solutions, it was noted at the oblast party-committee plenum.

The introduction of such a major innovation as gaslift inevitably leads to a restructuring of management organization at oilfield installations. However, in this sphere the industry's staff has limited itself to half measures.

Only compressor stations and pipelines are under the jurisdiction of the specialized "gas" administrations that have been created within the oil-recovery associations. The other oilfield facilities are operated by the oil and gas recovery administrations. The interests of the oil-recovery workers and the gaslift-recovery workers frequently do not coincide. Conflict situations, mutual recriminations and charges of negligence arise from this.

The gas "elevator," which is called upon to increase withdrawal of the Tyumen oil stores appreciably, is not gathering speed quickly. There are many causes, as we see. But merely citing them is not the best method for getting the job done. The specialists of Minnefteprom and its prime subunit--Glavtyumenneftegaz, which is charged with introducing the progressive method for recovering oil in West Siberia--apparently must be reminded of this.

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OIL AND GAS

NEW GAS ABSORBER DEVELOPED FOR MEDVEZH'YE FIELD

Moscow LENINSKOYE ZNAMYA in Russian 6 Jan 85 p 2

[Article by M. Belostotskaya from Podolsk: "For Northern Gas Workers" under the rubric "From Concept to Implementation"]

> [Text] The Urengoy, Medvezh'ye, Yamburg, Gubkinskoye, Zapolyarnoye and other gas fields of western Siberia, the Urengoy-Pomary-Uzhgorod gas pipeline, that delivers gas to the enterprises of our country and to western Europe are familiar names. They have become symbols of the successes of soviet science and technology. The development of the western Siberian oil-and-gas basin is continuing. Hundreds of organizations and enterprises are participating in it, including the Podolsk Central Design Bureau of Oil Equipment.

Specialists of the Central Design Bureau appeared for the first time in Tyumen Oblast about 10 years ago. They worked together with the drilling people and builders in Medvezh'ye. The designers faced the task of putting into operation the first domestic absorber built in the USSR that they had developed. What is an absorber? Prior to pumping natural gas obtained from wells into a gas main, it is necessary to cleanse it of remnants of clay drilling mud, mechanical impurities and excess moisture. Absorbers are needed to do this. These structures are as high as a five-story building. This first modular-unit variant consisted of three parts: a separator, an absorber and a filter. It weighed tens of tons. Tractor-sledge trains delivered the equipment across the taiga swamps and thickets. The absorbers were assembled in place, in special technological housings.

People worked selflessly: Construction time was cut in half. To complicate matters, there were climatic surprises--a temperature of minus 45 degrees in addition to the surrounding taiga and permafrost. While assembly was still going on, the Podolsk designers were already thinking over how to simplify installation. Taking into account its experience in the development of Medvezh'ye, on its own initiative the Central Design Bureau began scientific research on the design of a new, northern variant of the absorber; one with smaller dimensions and greater output.

Three years later, in Volgograd, they began the production of an absorber of fundamentally new design. Now it consists of a single column. Raw gas from wells or collection points flows into its lower part. There, fine particles of impurities are amalgamated. From there it flows into a separation tray where dropping liquid is removed. In the drying section, a liquid sorbent "squeezes" the last remnants of moisture out of the gas. After final separation, the gas is ready for pumping into the gas main. Here is how simple the design turned out to be. There are significantly fewer fittings, pipes, control instruments and control relays in it.

This means that it works more reliably. The economic effect of the introduction of just one system was 210,000 rubles. The absorber was soon awarded the state Emblem of Quality and the Gold Medal of the VDNKh [Exhibition of the Achievements of the People's Economy of the USSR]. The chief engineer of the Central Design Bureau, Yu. A. Kashitskiy, was honored with the State Prize of the USSR. The chief designer of the project, A. G. Yarmizin, received the Prize of the Council of Ministers of the USSR.

New wells were being spudded in and production capacities were being increased in the Transpolar region. Accordingly, new tasks arose. Production commenced of absorbers with a production capacity of up to 10 million cubic meters of gas per day. Designers undertook the development of an absorber of modular construction. This means that the basic units and service lines are manufactured in Volgograd and delivered in assembled form. All that remains is to set it up on site and connect together prepared subassemblies. This kind of design will save thousands of rubles. Modules of this type were received last year at the Yamburg field, above the Arctic Circle. Podolsk near Moscow continues to work for Siberian gas production.

12784
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OIL AND GAS

MANGYSHLAK'S KARAGIYE DEPRESSION GIVES PROMISING DRILLING RESULTS

Alma-Ata KAZAKHSTANSKAYA PRAVDA in Russian 16 Dec 84 p 1

[Article by I. Rodionov, KAZAKHSTANSKAYA PRAVDA correspondent at Mangyshlak Oblast: "The Oil From Karagiye Depression"]

[Text] Until recently, the Karagiye depression in Mangyshlak was talked about only as a notable geographic site. Indeed, this is the deepest depression in our country--it's 132 meters below sea level. In addition, what is perhaps one of the busiest routes on the peninsula runs along the depression. It runs from the oblast center to the city of oil workers, Novyy Uzen.

The Karagiye depression, however, became the center of attention of the oil workers of Mangyshlak in November. Here is what V. Kostyanov, deputy general director for drilling of the Mangyshlakneft' Production Association, has to say on that subject:

"From a depth of 3,650 meters, a stream of commercial oil was obtained from an exploratory well that was just drilled in the depression. The well has a rate of flow that's not bad: several tens of tons of oil per day. Approximate analysis showed that Karaginskaya oil is light, not viscous, suitable for transportation and a light-golden color. Due to its color, it was nicknamed 'the blonde' by the prospectors. Additionally, two more drilling sites in the depression have now been determined."

The forecast of the geologists is optimistic: there is a lot of data indicating that yet another deposit will be found in Mangyshlak.

Time will tell if these forecasts are correct. There remains only to add that the assertion that fortune accompanies the strongest has been confirmed in this case as well. One of the best teams of the Mangyshlak Directorate of Exploratory Drilling, the one headed by drilling foreman Viktor Lankin, drilled the well which brought up the first oil of Karagiye. This collective is one of the initiators of the competition in the association to give a worthy welcome to the 40th anniversary of Victory.

12784
CSO: 1822/146

OIL AND GAS

BRIEFS

ULTRADEEP WELLS IN TURKMENIA--Ultradeep wells have been drilled in the Barsa-Gel'mes field in Turkmenia, which provided commercial oil and gas from a depth of 5 kilometers. [Excerpt] [Moscow PRAVDA in Russian 9 Jan 85 p 1] 12784

EARLY GAS PLAN FULFILLMENT--Orenburg--Gas industry workers of the southern Urals have fulfilled their yearly plan ahead of time with regard to production, transportation and processing of gas and gas condensate. The collective of the Orenburggazprom Association extracted 47.5 billion cubic meters of gas and almost 3 billion tons of gas condensate. Success was brought about by the introduction of intensive methods of extraction and processing of raw material. The cost of production was reduced by 2 percent below that which was called for in the plan, which allowed expenditures on production to be reduced by 15 million rubles. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 27 Dec 84 p 1] 12784

USSR ACQUIRES GDANSK-BUILT SHIP--A ship of unusual design appeared in a berth of the Gdansk Shipyard imeni V. I. Lenin. It is a floating crane built by local shipbuilders on order from USSR under the auspices of the Shel'f Program. It is intended to be used for servicing of offshore drilling platforms. The Polish builders' new ship is characterized by unusual design. The vessel is equipped with powerful cargo-hoisting equipment and is able to take on board up to 300 tons of various types of cargo. The draft of this crane, which has received the name Atlet [Athlete], is only 2.3 meters. Two engines, 760 horsepower each provide it with a speed of up to 11 knots. Polish shipbuilders employed a number of technical innovations in the building of the floating crane. Thus, a thyristor unit is used for control of the ship. The principal feature distinguishing the Atlet from other vessels of a similar type is that it can perform loading and unloading operations in stormy weather. The construction of the floating crane series, notes the Polish press, is a concrete example of effective cooperation between the USSR and the Polish People's Republic. The launching of this vessel graphically illustrates the fact that implementation of the Shel'f program promotes the development of the Polish shipbuilding industry, and makes it possible to put new, progressive technologies into production. [Text] [Moscow VODNYY TRANSPORT in Russian 10 Jan 85 p 1] 12784

CSO: 1822/146

COAL

PROBLEMS IN KUZBASS COAL DEVELOPMENT

Better Mine Management Needed

Moscow SOVETSKAYA ROSSIYA in Russian 5 Jan 85 p 2

[Article by V. Denisov and V. Dolmatov, SOVETSKAYA ROSSIYA special correspondents, Kemerovo-Moscow: "Difficult Seams"]

[Text] The dimensions of the Imeni 50-letiye Oktyabrya Surface Mine are striking. We're standing along one edge, while the other "shore" is invisible in the frosty haze. You don't even notice the gigantic excavators right away in this huge bowl. Only when you descend along the broad, snaking road can you appreciate their size. The 16-cubic-meter bucket furiously gnaws into the cliff "softened" by explosions. Within seconds, a 120-ton truck is loaded. The next seam is being exposed... We are talking with V. I. Nesterov, leader of the excavator crew brigade. Vasiliy Isakovich has been awarded the USSR State Prize for outstanding labor achievements. His crew is one of the best in the basin--this year it will produce a half million tons of coal.

There are a number of outstanding collectives in the Kuzbass. They have expertly mastered their equipment and technology to achieve production records. Like V. I. Nesterov, other excavating machine operators have recently received the USSR State Prize: V. I. Antonov of the Kuznetskaya Mine and G. G. Yeremin of the Raspadskaya Mine. Among the best are the collectives of the Imeni Lenin and Imeni Dzerzhinskiy underground mines, the Krasnogorskiy Surface Mine, and other enterprises.

Alas, the successes of the leaders do not make up for the overall situation. For the seventh year, the main sector in the Kuzbass has been operating extremely erratically. In 1984, the coal producers had another production shortfall of about 5.5 million tons, putting many ferrous metallurgy and power generating enterprises on "starvation rations." There is a clear downward tendency: The Kuzbass miners were supposed to pass the 150-million-ton level in 1978, but today they are farther away from it than they were then.

There are three technological directions in the Kuzbass: surface mining, underground "dry" mining and underground hydraulic mining. If one analyzes

the contribution of each of these methods, a curious picture appears: surface-mine production is increasing, while underground production has fallen greatly. These trends have determined the overall situation in the Kuzbass.

It is the direct responsibility of the trusts in the Kuzbassshakhtstroy Combine to reconstruct and deepen underground mines, and prepare new mine levels for production. And here is the problem: since the beginning of the 9th Five-Year Plan, these mine-construction workers have not once fulfilled their annual plan. The combine does not have sufficient personnel or machinery and has a weak production base. SOVETSKAYA ROSSIYA has already written about this ("How to Get a 'Second Wind'," 21 January 1984). Alas, the situation has not changed.

How can this be? Must one really wait around until mine reconstruction is completed? No, almost all the mines have begun to mine coal in pitching fields, i.e., under inferior technological conditions. This is a known departure from mining principles. But it's better than no coal at all. Over half of the underground coal production comes from pitching seams. Of course, this makes mining much more difficult, and mine directors have a strong trump card to justify their lagging production. "The conditions are more difficult, so there's less coal," they explain. However, there are still collectives and entire mines which are overfulfilling their production plans. This means that one can take a different approach to working in pitching seams. We chose one of these places.

Five years ago, M. I. Naydov became the new director of the Imeni Lenin Mine in Mezhdurechensk. The mine is part of the Yuzhkuzbassugol' Production Association. Production at the enterprise was behind schedule, mainly because of insufficient working-face area. Mikhail Ivanovich decided to begin with accelerated reserve coal-face development.

"It's easy to say: accelerated development," says the director forcefully. "But how to you do it when you're short of entry-drivers? In general, people for some reason consider the workers who extract the coal to be the main elements in a mine. But you can't produce coal without entry-drivers. So we started by strengthening our entry-driving sections. We added two more sections to the existing two. We also added an installation section. They were all combined into a special production preparation service. We took the best new recruits and put them into entry-driving. We increased their wages and gave them morale-boosting incentives, making it a more prestigious profession."

By strengthing the auxiliary forces and developing the entire mining workforce, the mine made great progress, even in difficult seams. For example, in 1980 the mine produced 1.7 million tons of coal, while last year it produced 2.3 million tons. It is noteworthy that the production brigades now have a year's worth of developed coal faces to mine!..

The experience of the Imeni Lenin Mine has been transferred to other enterprises in Mezhdurechensk. The entire Yuzhkuzbassugol' Association is

distinguished by stable production, as are some enterprises in Kemerovo, Prokop'yevsk and other cities. We should note that the Imeni Dzerzhinskiy Mine has fulfilled its plan in each of the last 17 years. The secret to their success is the same: strengthen the auxiliary areas, speed the development of new coal faces and know how to overcome difficulties. I was able to talk with many Kuzbass miners. One of the main reasons they cite for the present situation is not only the delays in reconstruction, but also the lack of initiative--the hope that difficult problems will be solved "above ground." It is not at all unrelated that the volume of development work in the mines is dropping. "I'm tired of all the whining!" said M. I. Naydov curtly and angrily. There is certainly sufficient basis for that remark.

This argument seems very characteristic to us. Too many Kuzbass managers cover over their own nearsightedness and inability to adopt the proper tactics by citing the chronic shortfall in mine development work. This applies directly to the managers of most of the production associations, as well as to the Kuzbassugol' VPO, its director A. I. Petrov and its chief engineer V. M. Abramov. They have really taken no effective steps to widely implement the approach taken by the production leaders. Several times in the last year, measures were formulated to accelerate entry-driving work, expand production coal-face area and improve the inferior collectives, but the matter did not go much beyond good intentions. It is also hard to understand the position of the personnel in the Kemerovo Party Obkom, its mining industry department and in a number of gorkoms and raykom. They have been unable to disseminate the experience of the Mezhdurechensk workers and have accepted that fact that two thirds (!) of the basin's mines are chronically behind schedule.

By the way, the Kuzbassshakhtstroy Combine is developing plenty of possible approaches to accelerating mine reconstruction. Again, there are no noticeable results. The explanation is simple: it's profitable for the mine construction workers, not suprisingly, to quickly take on a large number of mines. This allows them to snatch the greatest "monetary" volumes. The combine's forces, as they are called, are dispersed over the entire basin: there are an average of 11 people at each construction site, explained S. I. Pavlenko, deputy director of Kuzbassshakhtstroy. Therefore, reconstruction work drags on. In 1984, the mine construction workers were to have put 3.1 million tons of capacity into production; they actually completed only half that. The present difficulties in the Kuzbass should suggest another tactic: don't take on all the projects at once, but rather select, together with the miners, the most important projects, ones that will produce the maximum output after completion. We note that the output capabilities of about a third of the mines are limited because of unreliable coal-face ventilation or a lack of other surface facilities. Therefore, the combine personnel and the miners should resolve this old problem as soon as possible.

Experience has shown that the coal-production enterprises can use their own personnel for mine reconstruction. This approach has given a second wind to the Nagornaya, Severnaya, Tsentral'naya and several other mines. In

this way, the miners can ensure the steady performance of their collectives for years to come.

The correctness of this approach is confirmed by the long practice of Kemerovougol' Association, which includes surface mining enterprises. At the Imeni 50-letiye Oktyabrya, already familiar to the reader, coal production has increased by 1.5 million tons over the past 3 years. New fields are prepared ahead of schedule at other surface mines, as well. It is noteworthy that in its 20-year existence, Kemerovougol' Association has not only fulfilled its plans, but has annually produced quite a bit more. Its general director, USSR state-prize-laureate L. M. Reznikov, said that subcontractors place the surface miners in a difficult position. But the Kemerovougol' miners annually put 20 million rubles into production using their own personnel. This multifaceted approach has resulted in the present situation where surface mines produce 37 percent of all the Kuzbass coal. At underground mines, we repeat, the production is falling.

The reasons for falling underground production at Kuzbass mines are well known to the sector's staff personnel. It should be noted that B. F. Bratchenko, Minister of the USSR Coal Industry, and his deputies often visit Kemerovo Oblast. There were several such visits last year. It is surprising, though, that the sector leadership has not been able to implement many measures prescribed under their command: the timely startup of individual production areas, accelerated entry-driving work...

Thus, the Kuznetsk miners alone are not at fault for the basin's present serious production shortfall. The Kuzbass miners have the capability, even under difficult working conditions, to halt the drop in mine output and fulfill their plan for the final year of the five-year plan. The collectives' efforts and the entire scope of necessary measures must be applied to this task.

But we must not forget that the Kuzbass miners are to increase coal production during the next five-year plan. In addition, the USSR Energy Program provides for an increase in Kuznetsk Basin coal production to a minimum of 220 million tons, 1.5 times the present production. This high figure cannot be achieved merely on the basis of temporary mine plans and expedient alternatives. An integrated, balanced program for developing the entire Kuzbass is needed. Management strategy and tactics need to be carefully adjusted. We will discuss this in the next article.

Basin-wide Management Approach Needed

Moscow SOVETSKAYA ROSSIYA in Russian 6 Jan 85 p 2

[Article by V. Denisov and V. Dolmatov, SOVETSKAYA ROSSIYA special correspondents, Kemerovo-Moscow: "Difficult Seams"]

[Text] It now becomes more obvious: the Kuzbass is to become the country's leading coal basin. Actually, both coking and steam coals are shipped from Western Siberia to the European USSR. The flow continues to

increase. Again, Kemerovo Oblast presently produces a little less than 150 million tons. This volume will soon need to be increased by 1.5 times. How can such a sharp increase be achieved? The answer is to determine years in advance the management strategy and tactics for the basin. This is what we were told by the directors of Kuznetsk underground and surface mines and production associations, by engineers, planners, economists, scientists and party and council workers. Their collective opinion is the basis of these comments.

First of all, what's the most convenient and advantageous way to produce coal? The answer would seem obvious: by surface mining. One worker there produces three times more coal per month than an underground miner. For this reason, surface mine development has been accelerated: in 20 years coal production from surface mines has doubled, compensating to some extent for the fall in underground production. But any increase must be underpinned by the timely opening of new, promising sections and by reinforcement of auxiliary services. Unfortunately, Kemerovougol' Association, which includes surface-mining enterprises, has fallen far short of this. For instance, a decision was made several years ago to construct new surface mines--the "Taldinskiy," "Karakanskiy" and "Bachatskiy;" but to date, progress has been slow.

Having been forced to boost production at operating surface mines, the miners have not been able to complete their development work. As a result, specialists calculate that the shortfall in overburden removal is over 300 million cubic meters. Therefore, the association has fewer and fewer reserves ready for production... It is no accident that the annual increase in surface-mined coal production in this five-year plan is nearly half that of the previous five-year plan. A stable increase in the future is possible only on one condition: that overburden removal not only be brought up to schedule, but that it be put ahead of schedule.

At the same time, practice shows that the reliance by USSR Minugleprom [Ministry of the Coal Industry] on developing only surface production in the Kuzbass is at best premature. The most valuable coal--coking coal--is mainly produced underground. Two thirds of the present underground mines produce this coal, and there's still a shortage of coke. In addition, no new underground mines have been opened for a quarter of a century. The figures show what this has led to: according to earlier plans, over 160 million tons of coal was to be produced in the Kuzbass in 1980, while present indications are that this goal will not be reached until the 1990's. In other words, the underestimation of underground mines has set coal production back 10-15 years.

Finally, permission was received to design two underground mines. It is unlikely that they will be of much help in easing the miners' burdens, though. These new enterprises will likely only help keep coal production at its present level. The Kuzbassugol' VPO believes that 8 to 9 new underground mines with a total production capacity of up to 30 million tons will be needed to provide significant production growth. The multiyear delay in reconstructing operating mines must not be tolerated any longer. The development of innovative hydraulic mining technology should provide faster growth rates.

Clearly, all of this will require large capital investments. We shouldn't forget, however, that it is more advantageous to invest in the Kuzbass than in other basins: for the same investment, the Kuznetsk Basin will produce three times more coal than the Donetsk Basin.

But more capital investment isn't the only factor. The funds now being received by Kuzbassshakhtostroy Combine are not being fully put into production. Even mine reconstruction cannot not be done on time using local construction workers. The primary reasons for the Kuzbass subcontractors being behind schedule is their insufficient production base and the personnel shortage. The longstanding mismatch between supply and demand at Kuzbasszhilstroy Combine is causing a long waiting list for apartments. The problems of Kuznetsk Basin development cannot be solved without sharply accelerating the construction of residential, social, cultural and service buildings. After all, Kemerovo Oblast, like other regions of Siberia, cannot fully meet its personnel requirements from the local work force. In order to get more workers into the area, more attractive living conditions must be created. Sociologists have calculated that every new apartment building provides more than 1,000 tons of additional coal production for an underground mine tons and more than 3,000 tons for a surface mine.

In short, the rapid development of the Kuzbass cannot not be a matter for the Kuzbass residents alone. This was the mistake of past years: the construction of coal-industry projects and the development of the social infrastructure were the responsibility of the local construction workers alone, mainly the subdivisions of Minugleprom. Everyone needs coal, and therefore concern for the sharp increase in coal production is not just a regional or even a sector-wide matter. Incidentally, the volume of near-term residential, social and cultural construction was recently determined. But the main subcontractors are again the Minugleprom construction organizations, threatening the fulfillment of even this modest program. This is the result of the traditional view of the Kuzbass and the underestimation of what this basin will mean for the nation's economy.

The strategy for developing the Kuzbass includes not only further increasing the number of underground and surface mines or accelerating the pace of cultural and service construction. It is also important to take a new approach to the problems of managing the basin's main sector. The sector is now broken down into technological and professional areas. There is Kuzbassugol' VPO, but it includes only underground mining enterprises. Surface mines are in a separate production association. Mine construction workers are part of a combine, as are residential construction workers. The organization barriers between them are strong: in order to influence the mine construction organizations, the coal producers must turn to the ministry. This disunity makes it impossible to carry out a unified technical policy, determine the priority of construction projects, or reorganize personnel...

The Kuzbass needs a single management that would have all the means and funds concentrated in it, including the coal machine-building plants. We would point to the Ukraine Minugleprom, which has all the republic's

subsectors under its authority. After all, the Kuzbass will soon catch up with this ministry in coal production. It would seem that the Kuzbassugol' VPO should become--in actuality, rather than just on paper--the authorized manager of the entire basin and receive the proper authority to do this. Of course, they must learn how to properly use these rights. The VPO management doesn't yet always manage what it has properly. For instance, a year ago at one of the representative meetings, Kuzbassugol' director A. I. Petrov said that the main reason for the plan not being fulfilled was the delay in development work and the insufficient production-face area. Recently, the identical statement was made. If the bottleneck is well known, why aren't measures being taken?

A special topic is the production associations created several years ago. The miners say that this management reorganization did nothing to help the mines. It made production management more complicated. Mine directors often have the role of merely carrying out orders and directions. For instance, the production association dictates how many entry-drivers, production miners or fitters a mine will have. Only the association has the right to approve a section chief. It even sometimes gets to the point where the director is told how to cut the faces, where to install the mining machines, where to send the brigades... Many years of this practice has led to a situation where some directors have accepted their new situation: it's a lot easier to just carry out orders! Could this be the reason that they no longer look on the unfulfillment of government plans as an extraordinary occurrence? Furthermore, with the present situation some directors who have initiative and the personal qualities to achieve production increases under difficult conditions sometimes have to sidestep the established rules.

Clearly, improving the management of the basin is one of USSR Minugleprom's first tasks. The mine directors, for instance, have lost their former independence because of the sector's staff. Ministry managers have even raised internal barriers between different subdivisions of the coal industry. The overall management style for the basin and the help it receives from the ministry can hardly be considered suitable for the present tasks. The frequent visits of Minister B. F. Bratchenko and his deputies provide only one-time assistance, instant action, and "pump up" the efforts. It's as if the production shortfall is only because someone didn't yell enough at someone else...

Forgetting about the future makes the basin's problems all the worse. Further delays are intolerable. Calculations made by Kuzbassugol' show that the proposed capital-investment increase in Kuzbass development and the accelerated pace of construction-installation work must take place during the 12th Five-Year Plan. If that does not happen, then capital investments must be put into production three to four times faster than specified in the Energy Program, which is hardly possible.

As we were told at the All-Union Scientific-Research Institute of Complex Fuel-Energy Problems, the institute's specialists are preparing proposals which will serve as a basis for the development of a targeted integrated program for Kuzbass development. This would seem to be the only proper approach. The future of the Kemerovo Oblast coal industry was recently

discussed at a meeting of the USSR Minugleprom collegium. Practical steps must now follow, taking into account the needs and interests of both the region and the national economy.

12595
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COAL

METHODS OF IMPROVING COAL OUTPUT DETAILED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 2, Feb 85 pp 72-78

[Article by A. Pyatkin, deputy director of VNIIKTEP /All-Union Scientific Research Institute of Complex Fuel and Energy Problems/ of USSR Gosplan, doctor of economic science and professor; and V. Sokolov, chief of the Political Department of USSR Gosplan, under the rubric "The Country's Energy Program": "The Productive Potential of the Coal Industry"]

[Text] The program being systematically carried out in our country to shift the economy over to an intensive route of development presupposes, along with growth in labor productivity, improvement in the effectiveness of utilizing the productive capacities of enterprises, and increasing the return from every ruble of fixed investment in industrial production. The decisions of the 26th Party Congress and of the December (1983) Plenum of the CPSU Central Committee indicated that the successful accomplishment of plan targets largely depends on efficiency in utilizing the enormous existing productive potential. In his speech on 15 November 1984 at the meeting of the Politburo of the CPSU Central Committee to review the draft of the State Plan of Economic and Social Development of the USSR for 1985, General Secretary of the CPSU Central Committee and Chairman of the Presidium of the USSR Supreme Soviet Comrade K. U. Chernenko called attention to the need for decisive improvement in economic operations and for economy of resources. Improvement in the utilization of existing productive potential has been of special importance during the working out of the draft on the Main Directions of Economic and Social Development of the USSR for the 12th Five-Year Plan and for the Longer Term.

It is well known that the capacity of a society to produce material goods is determined by productive potential (the means and resources available to it to carry out the productive process and the quantitative and qualitative parameters of them that maximize productive capacities), and more importantly, by rational utilization of them.

Increasing the efficiency of social production depends on the contribution made to the solution of this important task by each sector of it, and mainly by the primary sectors of industry, one of which is the coal industry. Characteristic of the coal extraction industry are its inten-

sive requirements for capital and labor. The value of the principal investments in the coal industry exceeds 27 billion rubles, of which almost a third goes to the active portion, including highly productive mining equipment for open-pit and underground methods of coal extraction. More than one million industrial production personnel are employed in the sector. The sector's productive capacity and the volumes of natural resources of coal opened up are continually growing.

Starting from the growing demands of the national economy for fuel and industrial raw material, the Energy Program of the USSR has made provision for a substantial increase in the extraction of coal, by substantially improving the utilization of the productive potential of both existing and new mines and pits, and by broadly disseminating advanced experience.

The coal industry is being continually modernized and reequipped, the working conditions of miners improved, and production mechanized on a large scale and concentrated through reconstruction and through the opening up of new mines and open pits. During the 9th and 10th five-year plans the sector's enterprises mined a total of nearly 140 million tons of coal per year. These were, as a rule, major enterprises with more modern and productive equipment and with substantial fixed production capital. As a result, in 1983 the average annual output of coal per mine reached 831,000 tons, and 4,130,000 tons for open pits, for a growth since 1970 of 17 percent for mines and growth for open pits by a factor of 1.5.

The sector's development has been accomplished mainly because of the progressive and more efficient open-pit method of extracting coal. The growth in productive capacities and in the volume of coal extracted has been achieved mainly by the opening up of major open-pit coal mines in the Ekibastuz, Kuznetsk, Kansk-Achinsk and other basins. Open pits account for more than 40 percent of all coal now being mined here annually. The cost of extracting each ton of coal in open pits is only two twenty-ninths lower than in mines, the return on investment is 4 times greater, and the productivity of coal miners is 10 times greater. Compared to other coal mines, the construction of open pits costs considerably less, and is accomplished much more quickly.

However, the coal industry as a whole is operating under pressure and not efficiently enough. In recent years there has been virtually no growth in coal output, and underground mining has even decreased. There has been a decline in the quality of coal mined and shipped to consumers and in labor productivity, and unit costs of coal mining have increased. This situation cannot be regarded as satisfactory.

The following are among the most important directions for solving the problem of the efficient utilization of the sector's productive potential and ensuring a high return from it.

Intensifying the utilization of fixed production capital and labor resources

Under the conditions of the present economic situation and the considerable growth rates in productive potential, prominence has been given to the requirement for a sharp increase in the efficiency of utilizing material and labor resources, which is of special importance to such a capital- and labor-intensive sector as the coal industry is.

In expanding its productive potential the sector has annually increased its fixed production capital by 1.2 to 1.4 billion rubles. However, the growth rates of coal mining have lagged behind the growth rates of the value of fixed capital, which has naturally led to a decline in the return on capital. Where, in comparison with 1975, the average annual value of fixed production capital has increased by a factor of 1.6, the average annual output of coal has been only 2.5 percent, as a result of which the return on capital in the sector has declined considerably.

How can this situation be explained? By several reasons, including the difficulty of the mining and geological conditions of extracting coal in connection with the constant deepening of mining operations and the increase in the number of mine seams being worked that are dangerous because of sudden blowouts of coal, rock or gas, and the decline in the relative number of coal seams having relatively favorable characteristics. On the one hand this makes it difficult to increase the output of coal, and on the other makes it necessary to expand fixed capital.

In recent years there has also been a constant increase in the value of major equipment per unit of output, and a relatively low level of utilizing it. For example, the value of the equipment of a longwall outfitted with a mechanized unit, when compared with a narrow-swath combine, a travelling scraper-conveyer and individual metal supports has grown by a factor of 5 to 15, while the output of coal from a single longwall under comparable conditions has grown only by a factor of 2 to 3, and the the labor productivity of stoping operations has hardly grown at all.

For these reasons there has been an increase in unit budgetary costs for the construction of new and the rebuilding of existing mines and open pits. Where capital investment in existing enterprises reached an average of 20.7 rubles per ton of coal in 1975, in the 10th Five-Year Plan coal in the amount of more than 90 million tons was mined, at a unit cost of 29.4 rubles. In the sector as a whole the output of coal mined per 1,000 rubles of fixed capital decreased by 24 percent from the level reached in 1975.

The trend toward reduction of output per unit of fixed production capital has been maintained, which can be explained not only by the need to construct coal mining enterprises under more difficult conditions, and other objective reasons, but also by inadequacies in design and construction. The value of the fixed production capital per unit of design capacity of

coal-extraction enterprises now under construction exceeds the sector average. In the Moscow Coal Basin, for example, mines are under construction whose fixed capital per unit of design capacity based on standard fuel is approximately 160 rubles, which is considerably higher than in many other basins. The output of these mines per 1,000 rubles of fixed capital will also be lower.

All of this speaks of the need to take special steps to ensure the intensified utilization of fixed production capital in the coal industry. The utilization of fixed production capital can be called intensive when it is at a minimum, while the output of coal is being sustained at the technically feasible and economically desired magnitude. It is therefore necessary to reduce fixed capital costs in the sector per unit of output (naturally, in each specific case to the economically desirable level), or to increase the output per unit of capital. These conditions are mandatory when planning the construction or reconstruction of mines and open pits.

It is essential to considerably reduce the amount of fixed capital maintained in existing enterprises, mainly by cutting down the number of low-yield drifts and inclined fields, by increasing the use of the capacity of equipment, etc. In other words, it is necessary to increase the concentration of production spatially, and efficiently intensify it in time by making wider use of current developments in the equipment and technology of the coal mining industry.

Under existing conditions it is clearly advisable to standardize the ratio between the magnitudes of fixed production capital and output, both at the stage of planning and in the process of running the enterprises. Standardizing fixed capital per unit of output achieved or maintained, naturally with consideration for the economic, mining, and social characteristics of coal mining enterprises, will make it possible to regulate the more efficient utilization of fixed production capital. This, in turn, will be favorably reflected in the production cost of coal in the area of reducing expenditures on materials.

We should recall that material expenditures in the coal industry as a whole make up more than half of all costs to produce the commercial product (about 52 percent in 1983). In connection with the growth of investment in coal mining and with the inadequacy of measures to increase the efficiency of utilizing the materials and energy resources consumed in the sector, material costs have continued to grow, among which the amortization allowance alone for the production cost of coal has increased by a factor of 1.4 in the period since 1975.

The efficiency of the productive potential of the coal industry largely depends on the level of utilization of its main production asset — labor resources. Analysis has shown that in past years, and especially in the Ninth Five-Year Plan, as a result of major steps in reequipping and in the integrated mechanization of production, growth in coal output was achieved mainly by growth in labor productivity.

In recent years, however, in connection with deterioration in the utilization of the productive capabilities of coal mining enterprises to carry out plan assignments, there has been an increase in the number of work days in the sector's mines, which has led to an increase in the labor force with regard to their assignment at work sites, and this has entailed a decline in labor productivity. For example, in comparison with 1975 the number of workers mining coal has increased 15 percent, but the labor productivity of the workers in this category has decreased 13 percent. Utilization of the active portion of the assets — the basic mining equipment — has worsened. For example, loading at an integrated mechanized face dropped from 840,000 tons in 1975 to 635,000 tons in 1983, or by 25 percent. The factor for the machine operating time of the stoping combines in these longwalls decreased to 0.25, the overall length of a shift on the technical standard to 0.4, and by the leading brigades to 0.4 to 0.5. The level of utilization of highly productive mechanized systems is not high enough. The number of brigades mining 1,000 tons or more per day has decreased.

Naturally, there are objective factors reflected in the utilization of basic assets, specifically the increasing difficulty of mining conditions. Even so, the main reasons are that in recent years there has been a decline in the rate of modernization and renovation of the productive assets of many mines and open pits, and that the unfavorable situation regarding the utilization of productive capacities has gotten worse in the mining industry. There have been definite shortcomings in the management and organization of production and labor. This has all led to growth in labor intensiveness in all the basic processes of underground operations. As in the past, one-fifth of the workers in the coal industry are employed at the surface of the mines. The level of manual labor is still too high, as a result of which a substantial portion of the workers are engaged in installing and repairing supports, delivering materials and equipment, road maintenance, and ancillary loading and unloading operations.

Labor productivity is of primary importance for the coal mining industry, as one of the most labor-intensive branches of industry. Growth in this highly important indicator will facilitate further development of progressive methods of coal mining (chiefly open-pit), integrated mechanization and automation of production, adoption of equipment of large unit output, considerable reduction in manual labor, improvement in industrial processes, optimization of production and labor (including regulation of operating procedures in mines), adoption of the brigade contract, and certification of work places. It is expected that the measures indicated by USSR Minugleprom /Ministry of the Coal Industry/ will make it possible in the years ahead to support growth in coal output not by increasing the labor force, but by growth in labor productivity.

It should be noted that one of the most radical ways of improving the sector's average indicators of the utilization of labor and material resources in the coal industry now and in the future is the more intensive development of coal mining in areas with favorable mining and geological conditions, where high levels of labor productivity and return on capital can be achieved. This means primarily the Kuznetsk and Kansk-Achinsk basins. Of course, this matter must be resolved from the standpoint of the national economy and in the context of the country's fuel-energy balance.

Improving the level of utilization of the productive capacities of existing enterprises

The quantitative capabilities of the sector's productive potential are defined by productive capacity, that is, by the category that determines the ability of the labor force assigned to an enterprise to maximize the output of a product, and the extraction or processing of raw material.

Increasing the level of utilization of the productive capacities of enterprises is a very important resource for increasing productive output without substantial investment, and an important factor for economic growth.

It is not only support for the planned volumes of coal mining that depends on the level of utilization of the productive capacities of existing enterprises, but the very important economic indicators of how they work (the production cost of coal, labor productivity of workers mining coal, return on investment, etc.), are also closely tied to the volume of production.

The USSR Ministry of the Coal Industry has developed and is implementing a number of measures to improve the utilization of the sector's productive capacities, and mainly of mines that are not fully utilizing them. In 1984 alone provision was made to complete reconstruction at 10 mines and open pits, for an increase in output of 7.3 million tons of coal per year, at 32 mines to set up the necessary stoping front, at 39 mines to uncover and develop reserves in new drifts, and at 18 to drive and deepen shafts. Steps have also been taken to improve support for existing mines with the necessary materials and financial resources.

As is well known, the main direction for improving the efficiency of utilization of productive capacities is the reconstruction and reequipping of existing enterprises on the base of new and highly efficient industrial processes and equipment. These measures can be accomplished in a shorter time and with considerably less investment, and yield a higher return on capital than with new construction. The accomplishment of these measures will aid the consolidated annual plans that have been developed for reconstruction and reequipping through the sector as a whole, and the corresponding plans in production associations and enterprises.

More than half of all investment allotted to the sector in annual plans is being provided for reequipping and support of the productive capacities of coal mining enterprises, which will help to expand output, improve the status of mine assets, and increase the level of mechanization of labor. The proportion of coal mined at integrated mechanized faces grew from 25.2 percent in 1970 to 72 percent in 1984, and in the Karaganda, Pechora, Moscow and several other basins, there is almost total integrated mechanization of coal mining.

With the objective of further improving the level of mechanization and automation of coal mining, there has been a start in serial production in the sector, mainly in coal machinery building plants, and in the adoption of mechanized systems of a new technical level of types KM-103, KD-80, KMT, 1KUP and 2KUP, and of systems of equipment to perform preliminary processing. Measures are being implemented to carry out integrated scientific and technical target programs, to accelerate the reconstruction and modernization of enterprises, and to improve the technology of coal mining.

This implementation of major steps in the area of scientific and technical progress, particularly at open pits, the growth in the mining of coal by rotary equipment, the adoption of excavators, trucks, bulldozers and other mining transport equipment of high unit output, and other steps will make it possible to increase the utilization of the productive capacities of existing enterprises, and ensure that the natural resources of cheap coal in the country's eastern regions will be brought into more intensive economic use.

However, the productive capacities of half of the sector's enterprises are far from being completely utilized, and that is one of the main reasons that they are working under pressure.

Because of the limited capabilities of construction organizations, and shortcomings in the planning and organization of construction work, the reconstruction of many mines, especially in the Kuznetsk Basin, has been going on for 15-20 years, and the modernization of mines is also being accomplished slowly. As a result, many of them are operating on temporary schedules, which complicates transport and ventilation. The rate at which mining operations are being concentrated is not adequate. Nearly one out of four mines produces less than 300,000 tons of coal per year, which impedes the adoption of contemporary equipment, and is one of the reasons for low technical and economic indicators.

Given the special importance of rebuilding and modernizing existing mines, there must be a radical change in the state of affairs in this area. Needed here is an array of technical, economic and organizational steps to intensify the process of renovation and increase the efficiency of utilizing the sector's productive potential. Chiefly, it is necessary to increase the share of reconstruction and reequipping in the total volume of financial and material resources being utilized in existing basins. Resources for this goal must be found mainly within the sector

itself through the more rational distribution and utilization of allotted resources. For example, under present-day conditions the construction in a number of the country's basins of mines and open pits with a unit investment of 200-300 rubles per ton of coal can hardly be considered efficient, compared to the 50-60 rubles for reconstructing coal mining enterprises in the Kuzbass, for example.

The development of work to accelerate the reconstruction of enterprises is also being impeded by the fact that in comparison with new facilities they are less profitable to construction and design organizations. Here, manpower costs are higher than for new construction, and the total volume of construction is lower. In other words, this work is more labor intensive, but the earnings of those directly involved — construction workers and designers — are lower. A system of measures is greatly needed to encourage priority treatment of the work of reconstructing, supporting, and reequipping existing enterprises.

The rated capacities of the majority of newly commissioned and reconstructed coal mining enterprises are slow in being reached. From this alone in 1983 new and reconstructed mines and open pits put into operation since 1975 were short by 6 million tons of coal (comparing rated capacities with the levels reached).

This situation has arisen because new and reconstructed mines are often put into operation with a great deal unfinished and with insufficient development of the stoping front. Lengthy construction times for new and rebuilt enterprises have a negative impact on the attainment of rated capacity, since decisions reached earlier become obsolete and often prove inadequate for newly developing production conditions. In this connection, when preparing draft plans for coal output for enterprises that have reached their rated capacity, it is also advisable to develop measures to ensure that the design indicators will be reached in the times provided for in approved standards.

A major resource for improving the level of utilization of the productive capacities of existing enterprises may be to ensure a fuller and more equitable burden on all industrial units — from the working faces to the surface components. Analysis of materials in the latest periodic report of the productive capacities of enterprises showed that the throughput of many industrial units considerably surpassed the installed capacity of mines, and that hoist, underground transport, ventilation and production components at the surface, surpassed it by almost one-third. At a number of coal mining enterprises the situation has worsened for a number of reasons, so that because of a single production unit (bottleneck) the productive capacities of other units do not reach more than half. At present, 70 percent of mines that have not reached their capacity, the bottleneck is the stoping front. With normal development of mining production, this situation could not occur. In recent years, throughout the USSR Ministry of the Coal Industry as a whole, the average length of the operating lines of working faces has been 10-12 km less than planned,

which is equivalent to an annual loss of approximately 10 million tons of coal.

Considering what has been said, it would be advisable to incorporate into the analysis of the utilization of the productive capacities of operating coal mining enterprises a special indicator to reveal disparities in the productive capacities of the industrial components of each enterprise, and the measure of the proportion between the component with the highest productivity and the component with the lowest productivity. The highest level of the utilization of productive capacities by the industrial components of an enterprise will occur when this proportion equals or approaches unity, while at the same time each component maintains the required level of operational reliability. Likewise, ensuring highly balanced productivity by all the industrial components of every enterprise requires a substantial increase in the level of equipment and broadening of the range of equipment delivered to the sector, improvement in the quality of repairing it and radical improvement in support for operating enterprises with spare parts and components and other material and technical means. In this connection, the problems of the further development of coal machinery building plants and repair plants of the USSR Ministry of the Coal Industry must be solved, and their material base must be strengthened, mainly with an up-to-date machine-tool inventory.

Since, with the adoption of the advances of scientific and technical progress and with changes in the mining technical conditions of the work, the productivity of specific components of operating enterprises may be changed in one direction or another, it is advisable, on the base of the sector's ASU /automatic control system/, to perform calculations on the productive capacities of operating enterprises by industrial components, and on the basis of the results to take steps to eliminate bottlenecks and imbalances. It is also necessary to establish sector norms to regulate the required level of utilization of the main operating equipment and the intensity of industrial processes at operating enterprises, with consideration for the actual conditions under which they operate.

There are frequent instances where, at specific periods of time, the productive capabilites of coal mining enterprises are not completely utilized because of breakdown in the timetable for delivery of railroad cars for loading coal, as has happened, for example, at open pits of the Kansk-Achinsk, Ekibastuz and other coal basins.

It is well known that the level of utilization of the productive potential of the coal industry is determined not only by how many tons of run-of-the-mine coal are mined, but also by its quality. The national economy needs growth in the amount of fuel, but not of inert rock, the proportion of which in coal mined is unfortunately continually increasing. Just since 1970 the ash content of mined coal has grown throughout the USSR Ministry of the Coal Industry from 22.6 to 26.2 percent, that is, effective utilization of the operating potential of the end product has decreased by 3.6 percent, or by approximately 20 to 25 million tons of coal annually.

Because of the increase in the ash content of mined coal and loss when concentrating it, growth in the commercial volumes of coal has considerably lagged behind growth in the mining of it. For example, in the period from 1975 up to the present, with a growth in the productive capacities and volumes of coal mined, the resources of it have remained virtually at the same level, and in the Donbass have even declined.

Many of the reasons for this phenomenon can and should be eliminated. For example, there are frequent instances in which mining cutting equipment is improperly used to cut wall rock. As in the past, considerable adulteration of coal is permitted because of the joint cutting of coal and rock when carrying out preliminary excavations. The conversion of many mines to the delivery of a bulk product holds back the reaching and expansion of capacities of commercial coal by these mines, since the carrying capability of coal hoists was not calculated for the delivery of rock.

The currently existing procedure of planning coal output, when the quality of mined and loaded coal is considered only in planning computations, does not favor the development of conditions to reduce the ash content of coal, or in the final analysis, supply the national economy with the necessary fuel resources for the effective utilization of the productive capacities of mines and open pits.

Improving the planning and evaluation of the utilization of productive capacities

A number of steps have been taken with the objective of improving the procedure of planning the productive capacities of industrial enterprises. USSR Gosplan has developed and approved the Basic Conditions for Calculating the Productive Capacities of Operating Enterprises and Industrial Associations (Combines); Methodological Instructions for the Development of Consolidated Plans and Plans for Reequipping Operating Industrial Associations (Combines) and Enterprises; norms for productivity and for the level of reaching design capacities and economic indicators adopted by enterprises and facilities; and other methodological and standardizing documents. The preparation of sector regulations and a manual is now being completed in conformity with these documents.

However, as has been rightly noted in a number of publications by scientists and planners, including Ye. Ivanov,* many problems of planning and utilizing capacities, especially methodological ones, have still not been solved. Among these problems we might mention the development of scientifically grounded norms for the utilization of the capacities of operating enterprises, estimating the economically desirable reserve

* Ye. Ivanov, "Proizvodstvennaya moshchnost': problemy i suzhdeniya" [Industrial Capacity: Problems and Opinions], PLANOVOYE KHOZYAYSTVO, 1982, No. 2, pp. 28-38.

capacities, and the practical use of these concepts in planning as the design, industrial, standard and rated capacity.

It is well known that the decree of the CPSU Central Committee and the USSR Council of Ministers "Improving the Planning, Organization and Management of Capital Construction", with the objective of enhancing the basis and improving the practice of developing five-year plans, has requested ministries to submit proposals on limits to investments and on creating new productive capacities based on norms for the utilization of existing capacities. In connection with this the ministries, including the USSR Ministry of the Coal Industry, are to develop and, with the coordination of USSR Gosplan and USSR Goskomtrud /State Committee for Labor and Social Problems/, approve by 1985 machine shift coefficients and norms for the annual amount of machine operation, and to set up accepted standards for the utilization of existing industrial capacities for 1986-1990, and update these coefficients, norms and accepted standards in every following five-year plan. All this will be of great practical importance in the area of improving the efficiency of utilizing the sector's industrial potential.

In the Methodological Instructions on Determining the Intensity of Plans, which were approved by USSR Gosplan, it is emphasized the one of the most important indicators of the intensity of the work of collectives is the level of utilization of productive capacities. It should be noted that in connection with this the productive capacity of an enterprise should itself be a relatively stable indicator, and should not be subjected to frequent changes.

In recent years attempts have been encountered in the coal industry by certain executives and employees of planning units to understate industrial capacities. Design, scientific-research and other organizations have been involved in the background of this. Under existing procedures coordination with USSR Gosplan is mandatory in every case of reducing industrial capacities. Despite this, however, there are frequent cases where, during a temporary reduction of the industrial capacities of enterprises, either because the coal reserves in an operating drift have been finished off and a lag has been permitted in opening up a new drift and the necessary front of the working face, or for other reasons, the USSR Ministry of the Coal Industry and industrial associations have made requests to reduce the mines' capacities.

In our opinion it is advisable to update and substantiate the productive capacities of mines and open pits during the working out of draft five-year plans and during the simultaneous working out of measures for the reequipping and development of mining operations, the elimination of bottlenecks in the technology of certain sections, and the utilization of existing productive resources. During the five-year period additional increases of an enterprise's industrial capacity should be allowed only to the economically desirable magnitude, if this should prove feasible and necessary.

It is effective to encourage the collectives of enterprises to maintain, and more importantly, to expand productive capacities, and to utilize them with minimum expenditures of material and financial resources. As a start, this experiment should be undertaken at a number of mines and open pits.

Since the 11th Five-Year Plan, USSR Gosplan has established a procedure for working out plan balances of productive capacities for the following five-year period. These balances were worked out for 1981-1985 for the coal industry. In the future, balances of capacities will be worked out for the main coal basins and for the sector as a whole. It is also advisable to produce a periodic report of productive capacities every five years, on the eve of working out the drafts of five-year plans, rather than at a longer interval as has been done in the past.

So far, no resolution has been found, when defining the measures of productive capacity, to the question of the amount of mine operating time. In the sector's existing normative documentation there is no correlation between the concept of capacity as the maximum possible output of coal and the figure of 305 work days per year, which is accepted when computing capacity. Under conditions where mines spend considerably more time in mining coal, the level of utilization of the capacities of enterprises often exceeds 100 percent. In 1983 more than one-third of all mines reached 105 percent or more of their standard capacity, and the output of coal by these enterprises exceeded their capacity by 44 million tons.

In recent years the number of plan days included some Sundays, and in 1984 the coal industry was allowed, with the concurrence of VTsSPS /All-Union Central Trade-Union Council/, to set up a schedule for continuous mine operation. Under this system of operation the annual productive capacity of 305 days does not correspond to the actual number of work days. As a result the level of utilization of the capacities of enterprises is distorted, comparability is disrupted, and even obtaining an indicator of productivity during planning is complicated. It is therefore advisable in our opinion, when working out the drafts of annual plans, to obtain an indicator of estimated daily productive capacity, which, on the one hand, does not depend on such an unstable indicator as the number of days worked per year, and, on the other hand, makes it possible to estimate more precisely and objectively the utilization of the productive capacity of an enterprise at each specific interval of time in the plan period.

Estimating the capacity of an enterprise by the annual amount of coal mined does not fully conform to the intensive route of development of production, since the same amount of coal mined can be achieved both by a normal operating program during the year and a correspondingly full daily burden on the enterprise, or by a reduced daily burden (corresponding to lower economic indicators), but counting in additional work from certain days off. In the latter case there is an economically less efficient (timewise) utilization of the productive capacities of an enterprise.

The feasible average daily output of coal of an operating mine should be calculated by an actual progressive estimate of the material and technical factors of production, and the annual output by multiplying the average daily output by the number of work days in the year. Thus, the annual output of coal is essentially the planned volume of production for a given level of utilization of productive capacity.

Without dwelling on other aspects of the problem under review, let us note in conclusion that considerable improvement in the level of utilization of the sector's productive potential under contemporary conditions is not only a feasible, but also a truly necessary thing, both from the standpoint of the overall requirements for converting the economy to an intensive route of development, but also from that of ensuring a better competitive position for coal when compared with other energy sources.

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MEASURES TO PREVENT ROCK BURSTS, GAS BLOWOUTS OUTLINED

Moscow UGOL' in Russian No 12, Dec 84 pp 15-17

[Article by A. M. Kurganskiy and A. P. Kovalev, candidates of technical sciences, Mining Institute imeni A. A. Skochinskiy: "Mining Seams Prone to Rock Bursts"]

[Text] The annual production of coal from seams prone to rock bursts is 65 million tons; in 1985, it will reach 80 million tons, or 20 percent of all the underground coal production in the USSR. About 450 hazardous seams (prone to rock bursts and gas blowouts) are presently being worked. Every year, about 425 km of development work is done in these seams, and measures are taken to prevent bursts and blowouts. In addition, continuous monitoring of the rock-burst hazard is carried out in 400 seams being worked below critical depths.

Development work in hazardous seams is accompanied by various safety measures. Total protection from rock bursts and gas blowouts is provided at 17.6 percent of the seams. This is done by undermining and overmining during development work. Regional safety measures are taken in 0.9 percent of the seams, and localized measures are taken in 81.5 percent of the seams. By 1985, the amount of mining in fully protected seams is to be increased to 20 percent, but localized measures to prevent rock bursts and gas blowouts will remain the main approach, at about 80 percent of the workings.

Among the most common localized safety measures are destressing by blasting (25 percent) and hydraulic loosening (17 percent). These methods are mainly used in Donbass mines. Other localized safety measures used in mines of the Donetsk, Kuznetsk, Karaganda, and Pechora basins are advance boreholes (2 percent), water infusion (2.5 percent), low-head seam wetting (0.5 percent), hydraulic cleaning of advance cavities (2 percent), and the formation of relief cavities (1 percent). Up to 30 percent of the total volume of workings is accompanied by current and seismic monitoring.

Most of the above localized safety measures are labor-intensive (they account for 30-40 percent of all the time and labor spent on workings), and therefore cause slow mining rates. In seams prone to rock bursts and gas

blowouts in the Donbass in 1982, for instance, the average advancement rates for continuous miners and drilling-and-blasting work are 90 and 40 meters/month, respectively. Such low rates of development work cause strains in working-face preparation, meaning that panels are not developed on schedule.

In recent years the trend has been toward an integrated approach to the problems of seam development and mining. This approach has been greatly aided by innovative mine plans developed by the Mining Institute imeni A. A. Skochinskiy [1]. In addition, the Mining Institute has developed mine plans in conjunction with the basin institutes [2]. These include standard plans for development work under conditions characteristic of the Donetsk, Kuznetsk, Karaganda and Pechora basins. These plans are integrated with development and mining plans, which together provide the maximum possible concentration and intensification of mining work and thus increase coal mining efficiency.

The mine plans [2] accomodate innovative entry-driving equipment, and provide reliable and effective methods for preventing coal bursts and gas blowouts. The layouts provide for the scientific organization of labor in entry-driving operations and for better safety.

In all, 44 efficient mine development and extraction plans were worked out. These plans have localized safety measures encompassing the characteristic geological and mining conditions for seams prone to rock bursts and gas blowouts. These plans are for mines in the Donetsk, Kuznetsk, Karaganda and Pechora basins.

The approved directions for sector growth call mainly for the use of continuous mining methods, taking into account the limitations caused by mining and technological factors. The continuous mining method, using GPK, 4PP-2 and 4PP-2Shch continuous miners, is proposed for driving entries with cross sections of 4.7-25 square meters under the following conditions: 1) seam inclination, ±10 degrees with rock intrusions of $k_p \leq 0.6$-0.75; 2) strength coefficient $f < 6$ (on the scale of Prof. M. M. Protod'yakonov) and 3) abrasiveness up to 15 mg. Under other conditions than the above, drilling and blasting is used, accompanied by loading and drilling-loading machines (1PNB-2, 2PNB-2, PPN-1S, 1PNB-2U, 2PNB-2B), drilling machines (BU-1, BUE-1M) and scrapers.

For continuous mining and drilling-and-blasting, the entry-driving machinery is selected for compatibility and suitability. Thus, for conveyor excavation, the entry-driving equipment consists of: a caterpillar-mounted continuous miner or loader (driller-loader) (such as 1PNB-2 or 2PNB-2B), working with a scraper (SR-70) and belt conveyor (1L-80, 1L-100, 1LTP-80), a freight-personnel monorail (6DMK, 4DMK), and a rock-burst- and gas-blowout-prevention installation. By providing both conveyor (main) and monorail (auxiliary) transport for entry-driving work, their installation and removal is less labor-intensive, and these means of

transport can be used in further production mining. For roadway excavation, rail-mounted equipment is used: PPN-1S loaders, BU-1 drilling units, and rockburst- and blowout-prevention installations.

The following methods of localized measures for preventing rock bursts and gas blowouts are recommended: 1) for the drilling-and-blasting method, destressing by blasting, forming relief channels, seam hydraulic loosening and water infusion; 2) for the continuous mining method, seam hydraulic loosening and water infusion, hydraulic cleaning of advance cavities, drilling advance boreholes, low-head seam wetting and forming relief cavities.

The main form of development work organization is the complex daily entry-driving brigade, consisting of shift links with the optimum (calculated by the methods in [1]) number of workers for the given mining conditions. Entry-driving links perform all the main and auxiliary work, including rockburst and gas-blowout prevention work and monitoring its effectiveness, in accordance with the work-organization schedule for each standard mine plan. A special service in the development section carries out preventive maintenance, extends belt-conveyors and rails, and brings materials to the face during the repair-preparation shift.

The work schedule at development faces depends on the localized methods of rock-burst and gas-blowout prevention used; the schedule is also coordinated with the production mining operation. Usually, the schedule is four six-hour shifts daily, part of which (one or more shifts) are devoted to rock-burst and gas-blowout prevention work. Thus, seam water infusion and the formation of relief grooves or cavities require part of a shift. Seam hydraulic loosening, hydraulic cleaning of advance cavities and destressing by blasting require a full shift. Drilling of advance boreholes requires three to four shifts, and low-head seam wetting requires 4-20 shifts. After the safety-work cycle is finished and its effectiveness has been monitored, one or several entry-driving cycles are completed during the same or following shifts. As a rule, after two to three entry-driving shifts (once a day), a repair-preparation shift is planned; in some cases, this shift is planned once every two days.

As an example, we will consider the proposed mine plan, featuring relief cavities, for conveyor excavation (see Fig 1) using a 4PP-2Shch continuous miner. Using continuous miners to form a relief cavity in the rocks intruding into the rock-burst-prone seam is a reliable and efficient method of preventing bursts and gas blowouts. It ensures high technico-economic indicators for the entry-driving work.

This layout is for horizontal excavation of a gently sloping, seam, prone to rock bursts and gas blowouts, 1.1 meters thick, with an intrusion of rocks with a strength coefficient of $f < 6$ on the Protod'yakonov scale and an abrasiveness of up to 15 mg (characteristic conditions for Donbass mines). The entry has a driving cross section of 17 square meters (taking into account the relief cavity) and a net cross section of 12.8 square

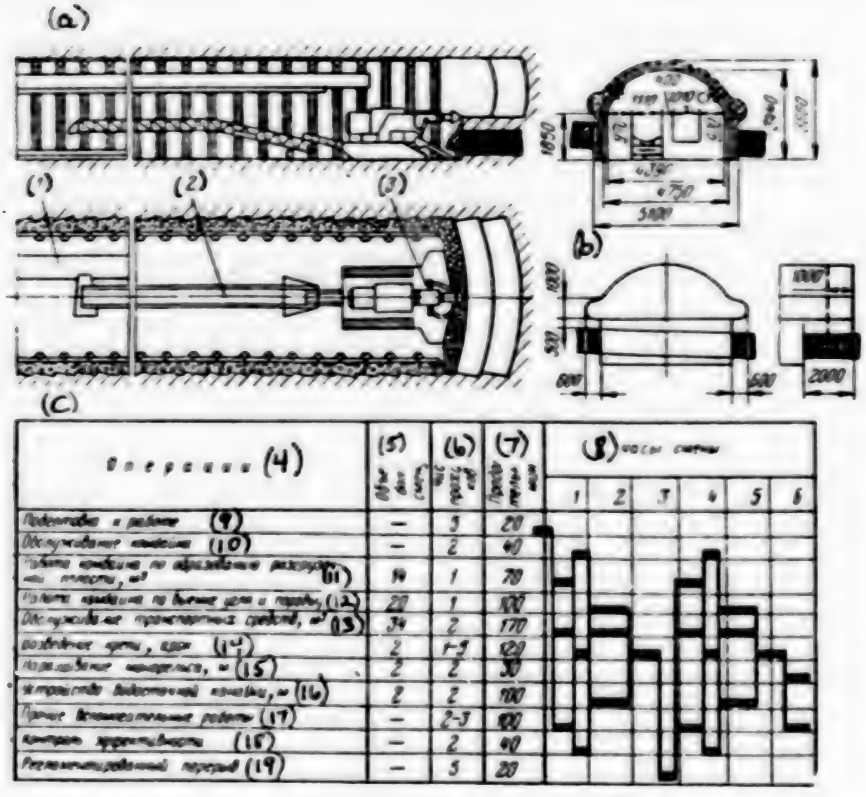

Figure 1. Technology for the Conveyor Excavation of Coal With Intruding Wall Rocks Using a 4PP-2Shch Continuous Miner:

a. excavation diagram
b. diagram of the relief cavity
c. work schedule

KEY:

1. 1LTP-80 telescoping belt conveyor
2. PPL-1K transfer attachment
3. 4PP-2Shch entry-driving continuous miner
4. Operations
5. Volume of work per shift
6. Number of entry-driving miners
7. Duration, minutes
8. Shift hour
9. Work preparation
10. Continuous miner servicing
11. Continuous miner operation to form relief cavity, cubic meters
12. Continuous miner operation to remove coal and rock, cubic meters
13. Servicing transport equipment, cubic meters
14. Support installation, arches
15. Monorail installation, meters
16. Construction of water drain channels, meters
17. Other auxiliary operations
18. Effectiveness control
19. Scheduled break

meters. The working was reinforced with AKP-3 steel arch supports spaced one meter apart, with full tightening of the walls and roof.

The excavation is done by a 4PP-2Shch continuous miner with an extended cutter. The broken coal and rock is loaded through a PPL-1K transfer attachment onto a 1LTP-80 telescoping belt conveyor. Materials are brought to the working face by a 6DMK monorail conveyor. VMTs-8 fans (the quantity is determined by calculation) are used for ventilation through a duct 600 mm in diameter.

Based on the above and the methodology in [1], the maximum possible advance rate of 2 meters/shift was determined, with a shift entry-driving link of 5 workers. A work schedule was developed, which provides for two entry-driving cycles of 1 meter each per shift.

The entry-driving begins with the formation of a relief cavity in the upper part of the entry (in the immediate roof), extending 0.6 meters past the walls of the finished section. The relief cavity is formed by cutter passes 0.5 meters deep (starting with a depth of 1.7 meters, then being extended by 1 meter per cycle) toward the seam and away from the roof, leaving a protective rock layer 0.5 meters thick between the seam and roof.

After the relief cavity is formed, two 3-meter-deep control holes are drilled to test the effectiveness of the cavity in preventing rock bursts and gas blowouts. The holes are drilled at a distance of 0.5 meters from the sides of the face and extend 0.6 meters beyond the projected face cross section at a depth of 2 meters. The gas-evolution dynamics are then monitored in accordance with [3]. If the cavity is found to be effective, then the coal and rock is removed for a distance equal to the spacing between arch supports (1 meter). If the monitoring shows unsafe conditions, it is rechecked one hour later. If conditions are then shown to be safe, the excavation continues for another 1 meter.

After the coal and rock removal has advanced by one support spacing, the support arch is installed with packing and bolting the roof and walls. After two cycles are completed (at the end of a shift), the monorail is extended. The work schedules provides for the combination, both in time and space, of the main and auxiliary entry-driving processes.

With a schedule for three entry-driving shifts and one repair-preparation shift per day working seven days a week, the advancement rate is 6 meters/day or 150 meters/month, while the productivity of an entry-driving miner is 0.4 meters/shift.

The technico-economic indicators for entry-driving work using this scheme, as well as using the other schemes developed [2], are 1.5 to 2 times higher than the average mine excavation indicators.

The implementation of the technologies in [2] ensures greatly improved technico-economic indicators for excavation work, while ensuring the timely and even development of production faces.

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COAL

SYNOPSES OF ARTICLES IN UGOL' UKRAINY, NOVEMBER 1984

Kiev UGOL' UKRAINY in Russian No 11, Nov 84 p 48

UDC 622.333.003.13(477.61/.62)

ENERGY EFFICIENCY OF COAL PRODUCTION IN THE DONBASS [Synopsis of article by V. V. Rzhevskiy and G. M. Galutskiy, pp 15-16]

[Text] A new indicator for energy efficiency in Donbass mines is described. Proposed applications of this indicator are presented.

UDC 622.232:622.013

OPTIMIZING THE NUMBER OF WORKERS IN MINING-MACHINE INSTALLATION AND DISASSEMBLY LINKS [Synopsis of article by V. G. Samarin, pp 16-17]

[Text] An economic-mathematical model is presented for optimizing the size of installation and disassembly links for working-face mining machines.

UDC 622.673.1.004.67:622.014.2

COMPUTER-AIDED PLANNING OF MINE UNDERGROUND HOISTING EQUIPMENT REPAIR AND MAINTENANCE [Synopsis of article by V. V. Kozhekina and V. G. Fal'ko, p 18]

[Text] The task of developing a planning system for mine underground hoist equipment repair and maintenance is described. An approach is given to the solution of this task. The information-normative base for planning is described. The verification of this system at the Imeni M. Gorkiy Mine, Donetskugol' Association, is described.

UDC 622.232:658.28

MECHANIZATION OF OPERATIONS AT THE FACE END SECTIONS [Synopsis of article by I. A. Grigor'yev, V. I. Alifanov, and I. P. Kurchenko, pp 20-22]

[Text] The results of tests of a 0.8 NK recess-cutting machine are given. Its advantages over present machines are described.

UDC 622.232.75.004.62

REPARABILITY OF SO-75 AND SN-75 PLOW MACHINES [Synopsis of article by I. P. Zhigul'skiy, I. G. Mysochka and M. A. Galdin, p 23]

[Text] The main forms of lost work time when using plow machines are described. The reparability indicators for plow machines are given. Improvements in maintenance and repair are proposed.

UDC 622.233.5.054.8

HYDRAULIC IMPACT MECHANISM FOR ROCK DRILLS [Synopsis of article by G. M. Timoshenko, A. F. Yatsenko, and S. A. Selivra, pp 24-25]

[Text] A hydraulic impact mechanism was developed and tested. Its elements and their operation are described. It is used in rock drills, with process water as the working fluid.

UDC 622.243.2

DIRECTIONAL-DRILLING WEDGE FOR THE COAL INDUSTRY [Synopsis of article by B. F. Golovchenko and O. P. Prikhod'ko, pp 25-27]

[Text] A continuous-action wedge device is needed for directional drilling from coal-mine faces. The requirements for wedge design are described. The optimal set-up of the device to obtain the proper curve is described.

UDC 622.232.72:534.647

UDT DEVICE FOR TROUBLESHOOTING TRANSMISSIONS OF COAL-FACE MACHINES [Synopsis of article by I. A. Levites, V. A. Gordon and V. P. Tishchenko, pp 27-28]

[Text] The design and operating principle of a device to troubleshoot the transmissions of coal-face machines are described. The device measures the total transmission play. The results of commercial testing and device improvements are presented.

UDC 622.625.28.5:622.26

ON-GROUND CABLEWAYS IN DONBASS MINES [Synopsis of article by A. A. Rengevich, V. S. Troshchilo, and Ye. G. Petrishina, pp 29-30]

[Text] The operating indicators of DKN and DKN1 on-ground cableways at a number of mines in the Donbass are analyzed. Their effectiveness as auxiliary transport systems is also analyzed.

UDC 622.647.1-83.001.4

DESCRIPTION AND TESTING OF A NEW DRIVE FOR SCRAPER CONVEYORS [Synopsis of article by A. S. Morokhovskiy, G. Ye. Khvostikov and V. F. Grankovskiy, pp 30-32]

[Text] The new drive makes it possible to start up an overloaded conveyor by starting up the drives first and then engaging the conveyor. The drive operates at reduced chain speed when the conveyor is empty or during repositioning. There is less chain rundown after the conveyor is turned off. The conveyor with a P11OE drive has improved reliability and less downtime compared to hydraulic-clutch drives.

UDC 622.012.2:621.51.001.5

EFFICIENT OPERATING CONDITIONS FOR MINE COMPRESSOR STATIONS [Synopsis of article by V. I. Degtyarev, V. I. Myalkovskiy, O. I. Adylkanov and A. M. Nosov, pp 32-33]

[Text] A method is presented for determining efficient operating conditions for mine compressor stations. The regulation of compressor station productivity is described.

UDC 622.831.322.001.57

PHYSICAL MODEL OF THE ROCK-BURST PROCESS IN MINE WORKINGS [Synopsis of article by B. L. Zaslavskiy, pp 34-35]

[Text] Formulas are given for determining the dynamic parameters of the actual process, based on modeling results. A hypothesis of the distribution of two-phase flows of bursts in mine workings is analyzed.

UDC 622.47.7.6

NETWORK LIGHTING SYSTEM FOR PRODUCTION FACES IN THIN SEAMS [Synopsis of article by Z. M. Iokhel'son, A. V. Kravchenko and A. M. Gar'kovets, p 36]

[Text] A system has been developed for lighting the faces of thin seams mined by mechanized systems. The system uses 8-watt luminescent light bulbs with a high-frequency current source.

UDC 622.807.5:621.928.9.4

DETERMINING THE CONDITION OF THE MINE ATMOSPHERE IN MINING ZONES [Synopsis of article by A. Ye. Perezhilov, pp 37-38]

[Text] The article presents research and testing results of hydraulic separation, and microbiological, physico-chemical and multistage methods to reduce: 1) atmospheric dust, 2) the amount of aleurolite dust, 3) dust intensity and 4) specific dust formation.

UDC 626.862:502.757:622.01

DEWATERING THE SURFACE COAL MINES OF THE DNEPR COAL BASIN AND PROTECTING THE ENVIRONMENT [Synopsis of article by Ye. N. Rudnev, O. A. Spivak and S. A. Ustinov, pp 38-39]

[Text] Present dewatering practice in the Dnepr Coal Basin is described. The water-bearing horizons and their filtration parameters are briefly described. The environmental effects of the Morozovskiy and Protopopovskiy surface mines are evaluated.

UDC 622.011:553.93.076(477.8)

FEATURES OF THE DISTRIBUTION OF COAL-SEAM EROSION IN THE L'VOV-VOLYN BASIN [Synopsis of article by V. F. Shul'ga, V. I. Selinnyy and V. Ya. Karavayev, p 40]

[Text] The principles of coal-seam erosion distribution in the L'vov-Volyn Basin are discussed. The uneven nature of territorial erosion development is explained.

UDC 622.01:528.015.001.5

STABILITY OF UNDERGROUND SURVEYING POINTS [Synopsis of article by N. F. Shevchenko, L. G. Shevkunov and N. N. Fabrichnyy, pp 41-42]

[Text] The factors affecting the stability of the points in underground surveying grids are analyzed. Recommendations are given on efficient ways to secure these points.

UDC 622.4:622.016.22

DETERMINING THE EFFICIENCY OF A WHEELED ROCK-DRILL TOOL [Synopsis of article by I. A. Kupchinskiy and Ya. V. Pityn, pp 42-43]

[Text] A method of evaulating the technical condition and quality of wheeled rock-drill tools is presented. Formulas are given for calculating the condition indicators, obtained by compiling statistical data on actual tool life.

UDC 622.765.4.066.002.5.006.3

AERODYNAMIC FOAM SUPPRESSORS AT 'KALININSKAYA' AND 'UZLOVSKAYA' CENTRAL ENRICHMENT PLANTS [Synopsis of article by I. N. Keytel'gisser, V. S. Butovetskiy and A. S. Kirnarskiy, p 44]

[Text] An aerodynamic foam suppressor is described, and its operating indicators are given. Its application at "Kalininskaya" and "Uzlovskaya" central enrichment plants is described.

UDC 622.794.3

CONDITONS FOR THE EFFICIENT USE OF FLOCCULANTS [Synopsis of article by V. Ye. Shulyak and M. A. Vovchuk, p 45]

[Text] The conditions for preparation and efficient use of flocculants are presented. Recommendations are given on preparing flocculant solutions. The application of polyacrylamide and metas for thickening the flotation tailings of gassy coals is described.

12595
CSO: 1822/134

NUCLEAR POWER

PROBLEMS AT ROVENSKAYA NUCLEAR PLANT REPORTED

Kiev RABOCHAYA GAZETA in Russian 26 Dec 84 p 2

[Article by I. Pashchuk, correspondent: "Overrun Guidelines -- What Is Causing Irregulaties in the Construction of the Third Unit at the Rovenskaya AES?"; under the rubric "Adherence to Startup Schedule is the Law"]

[Text] On the economic calendar December is the hottest month. This is felt especially at large projects, where the situation is now hot, and their is enough emotional stress and physical work for anybody. The collective engaged in the construction of the million kilowatt unit at the Rovenskaya AES has not escaped it. Problems spring up everywher, like mushrooms after a rainstorm.

Everything began well. They rapidly poured the foundation, attaining record indicators for power engineering. Having experience in the consolidated assembly of sections and components ar preparatory sites and their installation in reactor and machinery buildings, the administrations of the Yuzhteploenergomontazh [Southern Thermal Power Engineering], Yuzhenergomontazh and Elektroyuzhmontazh Trusts, the main subcontracting organizations at the project, handled the planned work volumes at accelerated rates.

However, the unforeseen happened, there were suddenly unfavorable geological conditions. They understood and saw why the pace slackened. It became obvious that it would be very difficult to meet the previously planned deadlines. Nevertheless it was still possible to make up for lost time if the managers of the AES construction administration swiftly solved material-technical supply problems.

But this didn't happen. It required intervention by higher ministerial authorities. Even it did not help: construction participants do not implement decisions of the all union ministry commission on nuclear power engineering.

Many are at fault here. Take just the Kurakhovskiy Boiler-Machinery Plant in Donetsk Oblast. It failed to deliver 1,400 tons of metal structures, was almost a year late in delivering the frame for the machinery building and, since the first half of the year is delaying the sites for turbine generator servicing. Without them, turbine installation cannot begin. The plant is simply pursuing tonnage, incomplete structures are filling the warehouses, the return from them is low.

The Pridneprovskiy Ferroconcrete Structures Plant of the Soyuzatomenergostroy [All Union Nuclear Power Engineering Construction] Association is also throwing sticks in the wheels. It did not deliver complete sets of materials and failed to supply 726 cubic meters of girders for pipe supports. Columns for the supports are being delayed by the Donbass Power Engineering Construction Association. The Plant for Boiler-Auxiliary Equipment and Pipes in Bagleyskiy (Dnepropetrovsk Oblast) is also behind.

V. I. Bolotnikov, production department chief, waves his hands, "Our telegrams and almost daily telephone calls do not get results. All the promises to make up for the lagging remain empty."

All this turns into greater delays. Y. E. Krysin, chief engineer of the No 12 Assembly Administration of the Elektroyuzhmontazh Trust, could not hide his indignation.

"According to the schedule we should have been delivered 106 of 190 components for installation in the main reactor building. We have received only 41. We have not received a single one of the 27 pieces of electromechanical equipment or one of the 26 pieces of special equipment. Can really work this way."

Thus, the brigades sit idle. How can things be put in order here? Where are the results. Only 4 of 7 brigades in this trust have met their plan targets, the remaining ones are lagging.

Can one really work smoothly when the Elektroyuzhmontazh Trust failed to deliver 50 kilometers of cable, 10 kilometers did not show up from the warehouse base of Ukrenergotekhkomplektsnab [Possibly: Ukrainian Power Engineering Equipment Set Supply] and the Glavenergokomplekt Trust did not deliver 700 km of various types of cable? The latter is on the conscience of the AES directors, who were late in signing a delivery contract.

O. M. Sunin, who is performing the duties of section chief of the Yuzhenergomontazh Trust, explains, "We would already have been able to install interior walls in the reactor section from the 24th the the 41st check point, but we didn't have enough metal or reinforcement."

Similar complaints were made by B. G. Vartazaryan, a foreman, and A. F. Medved'. a brigade leader from the Yuzhteploenergomontazh Trust.

Ye. S. Roshchin, administration chief of this trust, supports the complaints of people previously interviewed, "Three quarters of the equipment we obtain is not complete. It doesn't take much though to see that we can't do high quality assembly work."

Designers have also let them down. The ATEP Institute [not further identified] in Kiev is delaying the development of engineering documentation. There are often changes in previous blueprints, increasing labor outlays and the wages fund.

The managers of organizations involved in AES construction are alarmed by problems of retaining workers. Because of the indefinite deadlines for introducing facilities, it is necessary to send people to construction work on the Khmelnitskaya, Yuzhno-Ukrainskaya and other AES. This gives rise to high labor turnover and leads to the violation of labor and production discipline

The third million-capacity energy block is rising in difficult conditions. Every day is a serious and important exam for builders and assemblers and all collectives working on the plant. This new giant should, without delays, be hooked up to the country's integrated power system. Precise and reliable orienting dates should now be set for this event.

11574
CSO: 1822/139

NUCLEAR POWER

ZAPOROZHSKAYA AES STARTS OPERATION

Moscow IZVESTIYA in Russian 13 Dec 84 p 1

[Article by S. Troyan, staff correspondent:"From the Site: Current from the Zaporozhskaya AES"

[Text] On 10 December, at 11:59, shift chief S. Teplov wrote in his daily log: "The first energy block of the Zaporozhskaya AES produced commercial current." Yet another nuclear giant in the European part of the country was "fired up". Its capacity is one million kilowatts. The Zaporozhskaya AES was built a few dozen kilometers from the oblast center. In order to save the Ukrainian black earth, the site was chosen in the so-called "Ivanovskiy Kuchugurov" -- a sandy steppe.

The very oldest building in the settlement for builders and operators, a five story unit, is not even 15 years old, while the highest, a 14 story unit, is taking in new dwellers simultaneously with the startup of the new energy block.

In contrast to all preceding nuclear power plants, the Zaporozhskaya AES was built by the flowline-high speed method, making possible a one-third reduction in the time required to build such complicated projects. An unusual construction base was built at the site of the Zaporozhskaya giant. A special design facility was built here. It essentially became an energy construction combine.

The plant for non-standardized equipment and pipes was producing long before the startup of the first block.

Such a powerful backup support area made it possible to put the blocks' construction "on wheels", in the way panel housing builders work successfully. According to engineers' calculations, by the time the sixth block at the Zaporozhskaya AES starts up, construction costs will have been recovered completely.

R. Khenokh, AES Construction Administration Chief, said, "Without exaggeration one can state that our station can be compared to the flagship of a new class of ships. The conveyor method for building such projects is a qualitatively new period in the sector's development."

Thus, the first energy block was built in 4 years and 9 months and was delivered as a "turnkey" project. This is still the world record. The previous record of 5.5 years belongs to a French firm. Future million kw plants will go into operation at intervals of one year!

A. Volkov, AES director, said, "The reactors and many control systems embody everything new and progressive in contemporary domestic and foreign science and practice. The majority of domestic components such as, for example, the nuclear fuel loaders, were built according to new plans."

In these busy days of the first block's startup, every day, just like the 10th, sees the beginning of an operational plan at the construction dispatching administration. This plan covers the construction of the second and subsequent energy blocks. The assembly line is operating!

11574
CSO: 1822/139

NUCLEAR POWER

BOOK: EXAMINATION OF AES SAFETY REGULATIONS

Moscow SOBRANIYE POSTANOVLENIY PRAVITEL'STVA SSSR in Russian No 20, 1984 pp 355-364

[Authorization of decree and Article 107 from booklet: "Collection of Decrees of the USSR Government", "Examination of Safety Regulations in Nuclear Power Plants", Izdatel'stvo "Yuridicheskaya literatura", Moscow, 24 pp.]

[Text] ARTICLE 107--Authorization of a Decree of the USSR State Committee for Safety in the Atomic Power Industry

The USSR Council of Ministers resolves:
To approve the accompanying Resolution of the State Committee for Safety in the Atomic Power Industry.

Chairman,
USSR Council of Ministers
Nikolay Aleksandrovich Tikhonov

Superintendent of Affairs
USSR Council of Ministers
Mikhail Sergeyevich Smirtyukov

Moscow, the Kremlin, 4 May 1984, No 409

Authorized by decree of the
USSR Council of Ministers
as of 4 May 1984, No 409

RESOLUTION
OF THE USSR STATE COMMITTEE FOR SAFETY IN THE ATOMIC POWER INDUSTRY

1. Gosatomenergonadzor [State Committee for Safety in the Atomic Power Industry] is an all-union agency of governmental administration.

Gosatomenergonadzor carries out its work in the national economy in supervising safety practices in nuclear power production facilities, including nuclear power plants of any designation (nuclear power plants, nuclear central heating and power plants, nuclear heat supply stations etc.), experimental and research and development nuclear reactors, and in the area of nuclear safety, and also of nuclear power plants on ships and other floating equipment.

The entirety of Gosatomenergonadzor's work regarding problems within its competence must be directed toward safeguarding the interests of the state, preventing accidents at nuclear power facilities, which accidents entail the escape of radioactive products or ionizing radiation above the standards set for normal operation. It also sees to the detection and analysis of the causes of these accidents and takes the necessary preventive measures. Finally, it sees to the improvement of the operational reliability and safety of all the nuclear power production facility equipment under its control.

Gosatomenergonadzor bears the responsibility for organizing and carrying out systematic and effective official supervision of safe working practices in the nuclear power industry.

2. Gosatomenergonadzor's main tasks are:

official supervision of the observance by all ministries, departments, enterprises, organizations, institutions and officials of established rules, standards and instructions for nuclear and technical safety in the planning, erection and operation of nuclear power facilities, in the designing and manufacture of equipment for these facilities, and in the storage and transport of nuclear fuel and radioactive wastes at the indicated facilities;

monitoring the development by ministries and departments, based on the requirements of scientific and technical progress, of standardizing technical specifications to insure the safe operation of nuclear power facilities;

to monitor the quality of equipment manufacture for all nuclear power facilities, and the carrying out, in the established sequence, of special technical receipt of basic nuclear power station equipment, including equipment manufactured cooperatively at the enterprises of member-countries of SEV [Council for Mutual Economic Aid] and the Socialist Federated Republic of Yugoslavia, for nuclear power stations erected in the USSR and abroad with the technical assistance of the Soviet Union;

the monitoring, according to an established sequence, of the quality of the construction of nuclear power facilities, and of the installation of equipment at these facilities;

monitoring the carrying out of measures for accident prevention at nuclear power facilities, and preparing enterprises for the elimination of these accidents;

monitoring the accounting of nuclear fissionable materials at nuclear power production facilities.

3. Gosatomenergonadzor carries out its official supervisory duties directly, and through regional agencies formed by it in an established order (administrations of districts and inspectorates), and carries out acceptance of equipment for nuclear power stations in SEV member-nations and in the Socialist Federated Republic of Yugoslavia, through specialists which it has sent abroad.

Gosatomenergonadzor is comprised of Gosatomenergonadzor and its regional agencies.

4. Gosatomenergonadzor is guided in its endeavors by the laws of the USSR, by the other resolutions of the USSR Supreme Soviet and its Presidium, by the decrees and regulations of the USSR Council of Ministers, by this decree and other formal standardizing documents relating to its scope, and by the recommendations of interdepartmental technical councils, and it insures correct application of the operative legislation in subdepartmental organizations.

Gosatomenergonadzor disseminates the practice of applying the legislation of safety in the nuclear power industry and develops proposals for its improvement, and submits them in an established sequence for the examination of the USSR Council of Ministers.

5. In accordance with the tasks entrusted to it, Gosatomenergonadzor:

a) in interaction with the USSR State Committee for Science and Technology and the USSR State Committee for Atomic Energy Use, coordinates the scientific research conducted by the ministries and departments which is directed at validating the requirements for safety at nuclear power production facilities, and validating the effectiveness of designs used to insure the safety of these facilities. Here, the scientific guidance for the research into the safety of nuclear power production facilities is provided by the Institute for Nuclear Power imeni I. V. Kurchatov;

b) examines and approves the list of rules and standards for safety and the plans for their development with the appropriate ministries and departments;

c) with the appropriate ministries and departments, it supervises the development of safety rules and standards which are applicable during the planning, erection and operation of nuclear power production facilities, and during the design, manufacture, installation and repair of equipment under the control of these facilities, and approves them in an established order;

d) supervises the development of sectoral standardizing and technical documents on nuclear power industry safety, including operating instructions for nuclear power producing facilities;

e) makes decisions on plans for state and sectoral standards having to do with problems of safety in nuclear power;

f) checks on the observation and analyses the effectiveness of regulations and norms for nuclear power safety:

during the planning, erection, operation and taking nuclear power facilities out of operation;

during the designing, manufacture, installation and repair of equipment, instruments and products which are under Committee control;

during the transportation and storage of nuclear fuel and radioactive wastes at facilities under Committee control;

g) monitors the observance of planning, design specification and technological documentation requirements, and of regulations, norms and instructions during construction of nuclear power facilities, and during the manufacture, storage, installation, testing, operation and repair of equipment, instruments and products for these facilities;

h) monitors the carrying out of measures to eliminate design and operational flaws and to improve the safety of nuclear power plants and improve the quality of the manufacture, installation and repair of equipment, instruments and products for these units;

i) examines proposals of ministries and departments on the submission of rules for planning nuclear power facilities and designing their equipment to enterprises and organizations within their jurisdiction, adopts the appropriate resolutions and also grants the enterprises and organizations the right to manufacture, install and repair equipment for nuclear power facilities, when the necessary conditions for completing the indicated work exist;

j) registers nuclear power facilities and grants permission to operate them when positive decisions are forthcoming from other official supervisory agencies during the month following presentation of the required materials (permission is subject to reapproval after five years and following every case of accident);

k) registers nuclear power facilities' pressurized equipment and piping, and gives permission for their operation and checks to see that they are correctly and promptly given their technical inspections by enterprises and organizations;

l) examines the following, which have been submitted by the ministries and departments for approval:

detail designs for reactor plants for nuclear power stations, ships and other floating equipment and experimental and research nuclear reactors;

data which substantiate the selection of construction sites for nuclear power plants, experimental, and research and development nuclear reactors, also plans for the erection of nuclear power facilities, in the sphere of coordinating them with safety rules and standards;

m) examines and approves the following lists, submitted by ministries and departments:

lists of enterprises and organizations under the Committee's control;

lists of equipment, instruments and products which are subject to special technical acceptance;

n) establishes the sequence and volume of operations for checking equipment and systems for nuclear power facilities and for the special technical acceptance operations carried out by the Committee.

6. In order to accomplish the tasks set before it, and to fulfill the duties entrusted to it, Gosatomenergonadzor has been granted the right to:

a) to conduct, at any time, checks of all facilities in its jurisdiction concerning problems included in the Committee's sphere of competence;

b) to bring in, in coordination with the corresponding ministries and departments, their enterprises, organizations and specialists, to conduct checks and investigations and give their expert opinions, and to be paid out of the specialists' expense accounts, estimated by the Committee;

c) to introduce proposals into the ministries and departments, and to present the directors of enterprises and organizations under the Committee's control with nuclear power safety regulations and norms which are obligatory for the implementation of the instructions to eliminate detected violations, and also to give the reasons and conditions leading to these violations;

d) to give, to officials of enterprises and organizations controlled by the Committee, instructions for the elimination of deviations from design solutions, violations of design or technological documents, and regulations, norms and instructions during the construction and operation of these facilities, and during the manufacture, storage, installation, testing, operation and repair of equipment, instruments and products controlled by the Committee;

e) to give, to officials of enterprises and organizations controlled by the Committee, instructions which are obligatory to put a stop to work which is conducted in violation of nuclear power engineering safety regulations, norms and instructions, and to seal up said work place or equipment;

f) to prohibit enterprises and organizations from shipping Committee-controlled equipment in such cases where safety regulations and norms are not being observed, and where there are deviations from planning, design and/or technological documentation;

g) to take appropriate measures, to the extent of shutting down nuclear power production facilities should safety regulations and norms go unobserved, and for deviations from specifications, or design and technological documents;

h) to bring, according to an established sequence, officials to administrative liability for violating nuclear power engineering safety regulations, norms or instructions;

i) to suggest to directors of ministries, departments, enterprises and organizations that, according to an established sequence, persons be relieved from their positions, or deprived, for a period of up to one year, of the right of technical leadership of operations, who:

systematically violate the regulations and norms for safety in nuclear power facilities or the requirements of other standardizing documents;

willingly do work, or allow equipment and facilities to be put into operation which has been shut down on the instructions of agencies of the Committee;

who have not taken training or passed an established sequence of examinations on nuclear power production safety regulations and norms;

j) to give heed to problems which are part of the sphere of competence of the Committee, and to listen to reports and information from representatives of ministries and departments, and from directors of enterprises and organizations;

k) to participate in technical inquiries,which are conducted according to an established sequence, and which look into the circumstances and causes of accidents at nuclear power production facilities and, for each problem which relates to the Committee's sphere of competency, to carry out the obligatory solutions based on the findings of the inquiries;

l) in the appropriate instances, to hand over materials to investigative agencies to make the guilty parties criminally responsible;

m) should ministries, departments, enterprises or organizations have the need, to call for check tests of equipment and materials, check analyses of the working environment, and technical examination of equipment, instruments and products;

n) to receive information from enterprises and organizations on the state of safety at nuclear power engineering facilities, on operational indicators, and on the causes of equipment breakdowns, and to receive, from directors of enterprises, organizations and facilities, and from other officials--explanations of problems relating to the Committee's sphere of influence, and scientific and technical reports and information by existing forms of reporting, technical specifications for facilities under the control of the Committee, and technical processes, all of which are necessary for purposes of familiarization;

o) to check, within subordinate enterprises and organizations, on the observance of the established order for allowing workers to work, on their certification, and on checks of their skill-levels, and on whether they have appropriate documents;

p) to take part in checking the knowledge level, regarding safety regulations and norms, of supervisors and engineering and technical workers of subordinate facilities, and to make spot checks of these personnel regarding such knowledge;

q) to determine, in accordance with interested ministries and departments, the necessary additional scientific research, experimental design and planning operations, which are meant to improve the safety of nuclear power facilities, and for including them in the plans of corresponding organizations according to an established order, and also to conclude agreements with scientific research, designing and planning organizations of the ministries and departments about carrying out these operations.

The rights stipulated in the above paragraph are granted to Gosatomenergonadzor agency officials to the extent determined by the Committee Chairman.

7. Gosatomenergonadzor is headed by a chairman appointed by the USSR Supreme Soviet, and between sessions, by the USSR Supreme Soviet Presidium, with subsequent presentation to the USSR Supreme Soviet for confirmation. The Gosatomenergonadzor chairman has deputies, appointed by the USSR Council of Ministers.

The Gosatomenergonadzor chairman bears personal responsibility for the carrying out of the tasks and obligations entrusted to Gosatonenergonadzor, and he establishes the degree of responsibility for the Chairman's deputies and the directors of the structural subdivisions of the Committee's central apparatus, in the leadership in the Committee's individual spheres of activity and for the work of the organizations of the Gosatomenergonadzor system.

When carrying out his duties, the Gosatomenergonadzor chairman enjoys the rights of a USSR minister.

8. The Gosatomenergonadzor board is made up of the Gosatomenergonadzor chairman, who is chairman of the board, deputies to the Gosatomenergonadzor chairman, according to position, and also other leading Gosatomenergonadzor workers.

The Committee's board members are approved by the USSR Council of Ministers.

At its regularly convened meetings, the Gosatomenergonadzor board looks into the problems of improving state supervision of safety in nuclear power production, and other fundamental topics of the Committee's activity, discusses questions of the practical leadership of organizations within its jurisdiction, checks on the implementation of resolutions, the selection and utilization of labor forces, plans for critical documents brought into the higher agencies, as well as the Committee's decrees, orders and instructions, and hears reports

from the supervisors of the structural subdivisions of the Committee's central apparatus and organizations within its jurisdiction; it hears out each question within the sphere of its competence, and hears reports and information from ministerial and departmental representatives, supervisors of subordinate enterprises, scientific research, planning and designing and other organizations and plant-manufacturers of equipment used in nuclear power production facilities.

9. Gosatomenergonadzor issues orders and instructions, and produces directives which are indispensable for the performance of the duties of the subdivisions of the Committee's central apparatus, and the Gosatomenergonadzor system organizations.

Within the bounds of its competence, Gosatomenergonadzor issues decrees which are indispensable in the performance of the corresponding ministries, departments, enterprises and organizations.

In necessary cases, Gosatomenergonadzor issues decrees conjointly or in accord with other interested ministries and departments.

10. Gosatomenergonadzor implements measures for international cooperation in the field of safety in nuclear power production, and maintains, in established order, communications with the International Atomic Energy Agency and with State Committees for Safety in the Nuclear Power Industry of SEV [Council for Mutual Economic Assistance] member-nations and other countries, conducts negotiations, develops and presents proposals for scientific and technical exchange, and presents plans for agreements with foreign countries on questions which belong to the Committee's sphere of competence, and also sends the appropriate specialists abroad.

11 A scientific and technical council has been formed within Gosatomenergonadzor to examine questions included in the area of the Committee's competence, and also gives expert advice in the examination of construction plans for nuclear power production facilities and for analysis of the results of their operation.

The personal make-up of the indicated councils and positions on them are authorized by the USSR Council of Ministers.

12. The structure and number of workers comprising the central Gosatomenergonadzor apparatus are authorized by the USSR Council of Ministers.

The regular time-table of the central Gosatomenergonadzor apparatus is authorized by the Committee chairman.

13. Gosatomenergonadzor sets up, reorganizes and liquidates regional agencies within its set limits for numbers of workers and budgetary allocations, authorizes positions on these agencies, and organizes a network of non-staff inspectors, who work in positions authorized for them by the Committee.

Gosatomenergonadzor works in close contact with other state supervisory agencies.

14. Gosatomenergonadzor issues an information bulletin (a free publication) which deals with problems of safety in nuclear power production, accident prevention, improving the monitoring operations of subordinate agencies, and deals also with the most important achievements of science and technology, and of leading experience in these fields.

15. The enterprises and organizations which are under Gosatomenergonadzor control, in order to create normal working conditions for Committee inspections, are obligated to provide the inspectors with:

a) the necessary documents (specifications, blueprints, instructions for operation, and for storage of output, All-Union State Standards and other information materials);

b) accurate monitoring and testing instruments and tools, personnel to conduct the tests and operations associated with the carrying out of supervisory functions, and the necessary data from laboratory analyses;

c) the necessary special clothing, special footwear, and other personal protection equipment;

d) utility rooms, clerical services, intercity telephone and telegraph communication and transport;

e) a family-size living area from the housing facilities of the enterprise or the organization, and, in the absence of living area, this should be provided from other sources, in accordance with the executive committees of the local Councils of People's Deputies;

f) all forms of social welfare, cultural and medical services on a level with the corresponding category of workers of the enterprise or organization;

g) the necessary scientific and technical information and literature on the usual terms.

16. Gosatomenergonadzor and its regional agencies possess the seal with the image of the State Emblem and its designation.

12659
CSO: 1822/118

NUCLEAR POWER

BRIEFS

FIRST ZAPOROZHSKAYA UNIT STARTUP--The first 1 million kW unit at the Zaporozhskaya AES started producing energy for the country's Unified Power System. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 52, Dec 84 p 3] 11574

ZAPOROZHSKAYA UNIT STARTUP DESCRIBED--Energodar (Zaporozhskaya Oblast)--Exactly at midnight December 10 [1984] the startup of the Zaporozhskaya's 1 million kW power block was initiated. A. Volkov, director of the AES, said: "Prior to receiving permission to start up, over a several day period we conducted hundreds of experiments to determine the neutron physical characteristics of the reactor's active zone, and checked out the reliability of equipment and instruments." The construction of the Zaporozhskaya AES has passed an important test. Now the equipment (more than 100 types of it were used here for the first time) and the technology can be copied at other new sites. The first energy unit is picking up its load. Power engineering builders at this AES now face new tasks. The second unit at the Zaporozhskaya AES will be put on line next year. There is a real possibility to keep up this one a year pace for all other units. [By I. Sergeyeva] [Excerpt] [Moscow PRAVDA in Russian 12 Dec 84 p 2] 11574

YUZHNO-UKRAINSKAYA AES PARTIALLY COMPLETED--Construction work was completed on the first stage of the Yuzhno-Ukrainskaya AES. The State Commission gave operational approval for its 1 million kW first unit. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 3, Jan 84 p] 11574

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CSO:1822/139

NON-NUCLEAR POWER

GAES PROSPECTS FOR MOSCOW

Moscow MOSKOVSKAYA PRAVDA in Russian 30 Dec 84 p 2

[Article by I. Yesina: "Power for an Emergency"]

[Text] Soon Moscow will have its own power "storeroom." A pumped-storage power station is being constructed not far from the capital, near the city of Zagorsk. The plan is to put it into operation in 1985.

This place was not selected by accident. The designers--engineers from the institute Gidroproyekt [All-Union Planning, Surveying and Scientific Research Institute imeni S. Ya. Zhuk] under the leadership of S. A. Berezinskiy, found it 20 km from Zagorsk near the village of Vypukovo. The terrain relief and natural conditions have permitted the elimination of part of the flow of the Kun'ya River with a volume of 40 million cubic meters and the formation with delivery structures of two basins with about a 100-meter drop in levels. The upper basin was formed by earth dikes and 30 million cubic meters of water pour into here. The lower, a little bigger in volume, will be adapted as a reservoir. According to the designers' plan, the "brain" of the power plant is the station center which includes six pipelines with a water intake and an open electrical power switchboard being constructed near the lower basin. The builders are now finishing the erection and installation of the first pipeline and the first GAES [pumped-storage power station] unit will be started up and brought to full capacity by the end of the year.

What will the GAES give the Muscovites and those living in the central part of Russia? I ask Valeriy Nikolayevich Legasov, deputy chief of the Zagorskaya GAES Construction Administration's Production and Technical Division this question.

"The united power system of the Center and Mosenergo [Moscow Regional Administration of Power System Manage ent] are experiencing certain difficulties with power supply conditions over a 24-hour period. There has to be a peak load period for the day and evening hours. An enormous amount of power is freed up at night and surpluses of it appear. A portion of the "excessive" electricity enters the Volga and Ural power systems. The GAES takes and "preserves" the remaining surplus in order to return it to the city in the morning."

According to the plan, the GAES will operate in two modes. It will be in a pumping mode during the night-time hours. The power station takes power from the system and powerful pumps begin working, transferring water from the lower to the upper basin. This is how the power accumulation process occurs. The GAES is capable of "accepting" 1,320,000 kilowatts. The station will begin to operate in the turbine mode during the power consumption peak. The united power system will receive significant assistance during the four hours of GAES operation.

A water storage station has one other feature. It can quickly return all of the "preserved" power to the system. Therefore a GAES is an indispensable resource in emergency situations. Its commissioning will permit an annual savings of about 740,000 tons of standard fuel.

8524
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NON-NUCLEAR POWER

BRIEFS

MAYNSKAYA GES TURBO-UNIT START-UP--The first 107,000 kilowatt turbine unit was put into commission and placed under an industrial load at the Maynskaya GES [hydroelectric power plant], the companion of the Sayano-Shushenskiy power giant. With its start-up, the Sayanskiy territorial and production complex has received a new power increase. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 3, Jan 85 p 3] 8524

BAYPAZINSKAYA GES CONSTRUCTION DEVELOPMENTS--(Tajik SSR)--The first unit of the Baypazinskaya GES, which is being erected on the swift mountain Vakhsh River, will begin to generate power. High-speed assembly experts from the Nurek administration of the trust Spetsgidroenergomontazh [Specialized Trust for Hydroelectric Power Plant Installation Work], along with equipment suppliers and builders, are preparing the ahead-of-schedule introduction of electrical machinery. [By V. Surkov] [Text] [Moscow IZVESTIYA in Russian 9 Dec 84 p 1] 8524

AKTYUBINSK OBLAST POWER IMPROVEMENT--Aktyubinsk (KazTAG)--The 500-kilovolt Iriklinskaya GRES [state regional electric power plant]-Orsk-Aktyubinsk power transmission line, which was placed under an industrial load, has significantly raised the provision of power to the oblast's industrial enterprises. The 228-kilometer power mainline has been laid by the united efforts of the collectives of Uralelektroset'stroy [Ural Administration for the Construction of Substations and Electric Power Networks] and the Aktyubinsk eastern and western power network enterprises. Helicopter pilots have helped to overcome the complicated route terrain. This has permitted the assembly right on schedule of structures with special devices to protect the power "river" from overloads, locking, and ice formations. "The introduction of this third mainline connecting the oblast to the power system of the country," said Zapkazenergo [Western Kazakhstan Regional Administration of Power System Management] administrator A. F. Yur'yev, "will substantially help the labor collectives in the struggle to fulfill the tasks of the final year of the five-year plan." The Aktyubinsk people have obtained a reliable power base for the rapid growth of all sectors of the national economy. A speed-up in increasing capacities for extracting chromites and oil, for producing mineral fertilizers, and for strengthening the agricultural economy has been provided. [Text] [Alma-Ata KAZAKHSTANSKAYA PRAVDA in Russian 6 Jan 85 p 1] 8524

GAES CONSTRUCTION NEAR LENINGRAD--Leningrad--A pumped-storage power station, whose construction has started near Leningrad, at night will use the power of the thermal and nuclear "electricity factories" of the Northwest of the country in order to return this energy to the power system during the day, during peak loads. The first "landing" of Lengidroenergospetsstroy/Leningrad Administration for the Specialized Construction and Installation of Hydroelectric Power Plants/ administration workers arrived in the area of the GAES/pumped-storage power station/ basic structures. A production facility is being erected at a fast pace in the rayon center of Podporozh'ye and motor vehicle roads are being built to the construction site. Eight units, each with a capacity of 220,000 kilowatts, will operate at the station which will rise on a high hill near the Shapshi River. At night, the so-called reversible electrical machinery will begin to pump water into the reservoir at the top of the hill and then, in the peak hours, use it to generate electric power. The GAES will serve as a unique "receptacle" for electricity, permitting the obtaining of more power from already constructed thermal and nuclear power plants. For the present, during night-time hours when customers have been switched off, the blocks of these stations will operate on reduced power, increasing at the same time fuel expenditure for each kilowatt hour generated. Specialists of the Leningrad department of the institute Gidroproyekt/All-Union Planning, Surveying and Scientific Research Institute imeni S. Ya. Zhuk/ investigated 30 sites in five oblasts of the Northwest of the country before they decided to locate the GAES near Podporozh'ye. The main argument in its favor was the particular structure of the earth layers: clay was uncovered here in the lower layers--an excellent waterproofer for the more than 70 million cubic meter reservoir constructed on top of the hill. The station will annually generate more than a billion and a half kilowatt hours of electric power. Leningrad enterprises have begun to manufacture equipment for it. /By D. Mikhaylov/ /Text/ /Moscow IZVESTIYA in Russian 8 Jan 85 p 1/
8524

YENISEY RIVER POWER DEVELOPMENT--Sayanogorsk (Krasnoyarskiy Kray) (TASS)--The first unit of the Maynskaya GES has been placed under an industrial load. With the start-up of the youngest station of the Yeniseyskiy cascade, a fundamentally new stage in the efficient utilization of the river's water power resources has begun. Now behind the Sayano-Shushenskaya GES concrete dam, situated above the current, maximum water reserves can be created to operate in peak hours with the greatest load without harming navigation or the environment. The reservoir of the counter-regulating Maynskaya GES will help to maintain a stable level on the Yenisey. The third hydrostation on the Yenisey is also an excellent aid in supplying the electric power of the Sayanogorsk industrial center. /Text/ /Moscow IZVESTIYA in Russian 4 Jan 85 p 1/
8524

CSO: 1822/141

COMPRESSOR STATIONS

UDC [69.002.2:621.643]:[622.691.5:621.51]

INDUSTRIALIZATION OF PIPELINE OPERATIONS

Moscow MONTAZHNYYE I SPETSIAL'NYYE RABOTY V STROITEL'STVE in Russian No 9, Sep 84 pp 7-10

[Article by N.Ye. Stepanets, engineer at the First Saratov Assembly Department of Trust No. 7, "The Industrialization of Pipeline Operations During the Construction of Compressor Stations"]

[Text] The construction of compressor stations for trunk pipelines is a complex and crucial operation, both in the area of technical requirements and in organization of the industrial process. We shall discuss here some aspects related to pipelines laid by the First Saratov Order of Lenin Assembly Department of Trust No. 7, based on experience gained in the construction of Balashovskaya compressor station No. 27 on the Urengoy-Novopskov gas pipeline. At this station, 9300 m of pipe was assembled, including 1600 m of 1020-mm pipe with a wall thickness of 16 mm. The Balashovskaya compressor station is 250 km from the Assembly Department's field construction facility and 30 km from the nearest railroad station. On the basis of engineering and financial estimates, a work plan was worked out for the manufacture of the pipe and fittings by the pipe finishing shop at the Department's manufacturing plant, its shipment on 3 x 12-m trailers or special-purpose racks and its assembly, using SKG-40, MKG-25Br, MKG-40 and MKA-16 travelling cranes and Komatsu D-325S pipelayers.

The assembly of pipeline connections at the compressor shop was the most complicated and labor-intensive. Given little time and near-capacity quantities of pipe and equipment, the pipe was assembled in the largest possible sections in as finished form as possible. Pipe sections were manufactured in three lines at a pipe-finishing shop with a capacity of 3000 metric tons per year. The first line made 50-to-250-mm pipeline sections, the second 300-600 and the third 700-to-1000-mm sections. Each line did all basic operations: marking , cutting, finishing pipe ends and parts, assembling units from parts and lengths of pipe, mechanized welding of joints, assembling sections from units, welding joints between assemblies, coding and insulating sections, marking and laying.

In manufacturing assemblies, D_a = 700 - 1000 mm for wall thicknesses from 16 to 28 mm and up to 16 metric tons in standard pipe-finishing lines. But some

operations could not be done by customary methods. So a line was set up to make pipe sections where D_a = 700 - 1000 mm, using available equipment redesigned for this purpose. The procedures for certain operations were different from standard procedures, as were the equipment and other devices used.

D_a = 50 - 250 mm pipe with wall thickness from 5 to 12 mm was cut with circular saws and a movable lathe; D_a = 300 - 600 mm pipe was cut on a URT-630 bench; and D_a = 700 - 1000 mm pipe was cut on an all-purpose bench for cutting pipe manufactured at the Department's production facility: it consisted of a 70-SDA roller bench, a cutter and a profiling device (Fig. 1 [omitted]).

Given our supply of Soviet-made 1020-mm pipeline parts with a wall thickness of 28 mm and imported 1020-mm pipe with a wall thickness of 16 mm, we had to remove the rims from parts profiled for imported pipe. Benches were made to facilite rim removal (Fig. 2 [omitted]). Profiled parts (outlets and tees) were placed on these benches and a "Mikron" robot fastened the chucks down. Due to the difference in wall thickness and ovalization of the pipe and pipe fittings, the Department built special devices for joining nipples and profiled fittings. The nipples and fittings were lined up by the OD of the pipeline, using a chain centralizer, a gripping device and 20-metric-ton hydraulic jacks inside the pipe.

Automatic and manual welding were employed to manufacture and assemble pipeline assemblies. Welding the large-diameter pipe was the most complicated and labor-intensive. The 1020-mm imported pipe with a wall thickness of 16 mm and the 1020-mm connections with a wall thickness of 28 mm had different inside diameters and wall thicknesses. Due to the lack of adapter rings and the impossibility of boring the parts out, YuZhNIIgiprogaz [Southern Scientific-Research and Design Institute for Gas Enterprises] developed working drawings for using fittings and adapters with imported pipe. In making up valves and connecting parts to the pipe, the technical sequence for welding operations requiring preheating and the necessary internal "podsvarka" [preliminary welding] along the entire joint as specified in Recommendation R167-74, "Welding Technology Manual for Shut-off Fittings" and the requirements of SNiP III-A, 10-72, were strictly followed. After preheating to 130°C, welding was done continuously until the entire joint was completed. LV-52A electrodes 3.25 mm in diameter were used to weld the root of the seam on the outside as well as the inside weld. The semi-automatic ADF-1002 with a PSM-1000 welding transformer on a 70-SDA roller bench and an M-1007 manipulator were used with 3-mm Sv-08KhM welding wire under a layer of AN-47 flux.

Two brigades of automatic welders did the automatic welding on two benches. Each brigade had three welders. It took 20-25 minutes to weld a pipeline joint. The automatic welder did a joint of a pipeline section in 4 or 5 runs. The joint was cleaned prior to automatic welding and between runs with two grinding disks and wire brushes.

Jerking can occur while welding 1020-mm pipe with a wall thickness of 16 mm on a 70-SDA roller bench with an M-1007 manipulator. A counterweight balanced with a heavy object was rigged up to prevent this. The counterweight smooths

out the rotation and enables the automatic welder to form a seam. This reduces loads on the roller bench reducer gears, which often fail without a counterweight. All the electrical buttons controlling the rotator and the automatic welder are located on the foreman's panel. This increased labor productivity. Manually arc welding a section of 1020-mm pipe with a wall thickness of 28 mm requires holding the pipe at 130°C for 4 hours; automatic welding requires 25 minutes to complete a seam and one-time heating for 15 minutes.

Manual arc welding was mostly done in the assembly yard. Prior to welding, the Shvarts-Zk electrodes were hardened at 300-350°C and the LV-52A, OK-4800 and FOKS EV50 electrodes at 250-300°C for one hour. The electrodes were taken to the welding area in heated containers. The root of the seam was cleaned with a small grinder, using an abrasive disk. The following layers of the seams (see table) were cleaned with a special radial cleaning brush attached to the grinder. Prior to welding, the face and pipe surface were cleaned out to a distance of 10 mm on both sides of the joint, until the metal gleamed. Reinforcement of the finished seam was held between 1 and 3 mm. The joint was marked with indelible ink at a distance of about 150-200 mm.

Pipe Wall Thickness mm	Minimum Number of Layers of Seam
Up to 10	2
10 to 15	3
15 to 20	4
20 to 25	5

Two welders welded 530-to-1020-mm pipe simultaneously. Joints between a length of pipe and a fitting or a ball valve were preheated. The pipeline joints were gripped at 3 or 4 places, with the gripping length varying from 50 to 200 mm, depending on pipe size.

Joints were welded in the assembly yard in a non-rotating position. When the temperature fell below -10°C or when it rained or snowed, the assembly yard was sheltered. During unavoidable work interruptions, the joints were covered with warm mats which retarded cooling.

Preheating of the joints was done with multiflame propane burners in the shop and the assembly yard. A control system, consisting of a KSP-3 potentiometer and TKhA-151 thermocouples with a magnetic bracket and a contact wire, was assembled to measure the temperature of the pipeline joints. In the yard, the temperature was measured with temperature wands. After the pipeline assemblies were welded, the welded joints were heat-treated with KEN-3 combined-action electric heaters. A TDF-1001 welding transformer and a VD-301 welding rectifier provided the electrical supply.

Types MVT through TU 36-1846-77 insulating mats were used for insulation during heating. An automatic recording KhA-calibrated KSPD-2 potentiometer was used to control temperature during heat treating. Thermoelectric TKhA-151

thermometers were used for temperature gauges, and Type M LKV wires were used as compensatory leads. A Mir-2D X-ray device [Fig. 3 (omitted)] was used to inspect the welded joint after welding was completed.

In conformance with VSN Instruction 2-84-77 of the USSR Ministry of Construction of Petroleum and Gas Industry Enterprises, the pipe was insulated with a coating of Poliken and a jacket. To increase insulation quality and labor productivity at the plant, the process of insulating the pipe was mechanized, using a bench made by the Department. A DIP-500 lathe with hold-down clamps was used to rotate the pipe. Trailers measuring 3 by 9 m and 3 by 12 m were used to ship pipe weighing up to 18 metric tons. The assembly of connecting pipe was done with cranes and pipelayers in accordance with the PPR.

A characteristic feature of assembling connecting pipe was the requirement that operations be performed in strict accordance with a technological sequence: moving the sections to the assembly site; gas cutting and machining the ends to be welded; cleaning up the joints with grinders; preliminary placement into the desired position; fitting the ends together; raising the shelter over the work place; arc tacking the joint; heating the joint with circular gas burners; installing the device inside the pipe to remove gas during the welding process; two welders working simultaneously to weld the root seam inside the pipe; cleaning up the root seam with grinders from the outside; heating the pipe; two welders simultaneously arc welding the joint manually; and X-ray scanning of the welded joint from the inside. Only after performing these operations and receiving positive inspection results on the welded joint is it possible to assemble the next section, since the pipefitters, arc welders and X-ray technicians must always proceed in the direction of the open end of the pipeline.

Proceeding from these requirements, the PPR provided for performing the entire process of pipeline assembly simultaneously at several working points. At the first point, assembly began at the headers, where it was possible to enter the pipeline through the tee connections, and three entire brigades could work simultaneously. At the second point, the pipeline was assembled from the compressor stations to specially planned manholes where workers could exit after welding the last joint. Three complete brigades also worked at this point. The remaining sections of the pipeline were smaller than 500 mm, and for technical reasons a root seam did not have to be welded from the inside, and X-ray inspection was done through the two walls. Assembly was performed simultaneously by two brigades. Due to the limited number of hoisting devices, welding equipment, tools and other apparatus, as well as high labor intensity, all operations were done in two shifts. A complete brigade consisted of six pipefitters, one electric tack welder, two electric welders and one crane or pipelayer operator [Fig. 4 (omitted)].

With the proper labor organization of an entire brigade, it took 6 to 8 hours to put an assembly together and weld a joint of 1020-mm pipe with a wall thickness of 16 mm. The technical equipment was rigged up simultaneously with the pipeline and the fittings.

A specialized 8-member brigade insulated the joints, cleaning the joints with wire brushes, cutting rolls of film to the right size, heating to the required

temperature, wrapping sections of pipe with film and delivering them to inspection.

As the assembly of large-diameter connecting pipe showed, a brigade contract is most efficient. A brigade includes workers of every specialization required in the assembly process. Total remuneration for assembly work broke down as follows: 1.9% for hourly work, 12.3% for piece work and 85.8% for bonus piece-work. Seven brigades worked under brigade contracts and performed 58.6% of total construction and assembly.

As a result of the industrialization of pipeline assembly operations and the mechanization of labor-intensive processes, labor costs for assembly were reduced considerably: 13,466 man-hours were worked instead of 16,567 man-hours called for by the norm. Assembly of the compressor station took 7 months as opposed to 9 months called for by the norm. By comparison with the technical and financial indicators for manufacturing pipeline assemblies at the Department's plant in Saratov and shipment to the assembly site, manufacturing pipeline assemblies at the construction site saved 35,000 rubles. This shows that when undertaking assembly operations within a 250-km radius, it is better to manufacture assemblies at the factory. This reduces the time it takes to place the project in service and increases assembly efficiency and the quality of welding and assembly operations.

Balashovskaya compressor station No. 27 on the Urengoy-Novopskov pipeline was delivered to the State commission for service and accepted on first presentation with a rating of "excellent." The high quality of assembly made it possible to place the station on stream in less than the time allowed by the norms.

8844
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ENERGY CONSERVATION

CRITICISM OF SHORTCOMINGS IN MOSCOW FUEL CONVERSION

Moscow MOSKOVSKAYA PRAVDA in Russian 24 Jan 85 p 2

[Article by S. Pal'chikov, deputy director of the Moscow Gorispolkom Fuel and Energy Services Administration: "Strict Reckoning of Energy and Fuel. Winter Gives a Failing Grade"]

[Text] When the mercury falls below the -20°C mark all city services undergo a sort of test. The examiner is strict and uncompromising: winter is checking up on how we prepared for its arrival. Even the very first hard frosts, as a rule, can be a serious test of our organizational skill.

This season the first such check occurred at the end of November, when Moscow was hit by hard frosts. Lately the consumption of gas by boiler plants which provide thermal energy to supply heating, hot water and ventilation needs in homes and public buildings has increased sharply. In connection with the sharp drop in temperature city gas consumption significantly exceeded the average daily planned rate of consumption. Therefore, in order to ensure a steady flow in the capital's gas supply system, the Moscow City Council [Mossovet] Ispolkom and the Fuel and Energy Services Administration gave industrial enterprises instructions to switch to the burning of mazut.

It would seem that these instructions should not have taken any of the managers of industrial enterprises by surprise, since the roster of enterprises obliged--under certain conditions -- to switch to mazut in order to cover "peak" natural gas consumption periods had been established in advance by a resolution of the CPSU Moscow City Committee Bureau and the Mossovet Ispolkom. The requisite quantity of mazut and coal was stockpiled at the Mosenergo TETs and coal reserves were set up at the Administration's fuel bases as well. Mosgorplan [Moscow City Planning Commission] defined exact plan indices for natural gas usage by all consumers in the city.

In the course of preparations for winter all enterprises with mazut capacity announced their complete readiness for operation on that fuel. But the very first serious test of the winter showed that by no means all city enterprises were suitably prepared for cold weather. The managers of the RSFSR Ministry of the Textile Industry Combine imeni Shcherbakov, the Ministry of Industrial Communications Rubin Moscow Consumer Society, the Tushinskiy Reinforced Concrete Structures Plant, Glavmosstroy Apartment House Construction Combine #1,

the Ministry of the Chemical Industry State Scientific Research Institute for Chlorine Project Planning and several other Moscow enterprises turned out to be among such negligent natural gas fuel users.

How did the managers of these enterprises explain their refusal to switch to mazut? By the fact that at the beginning of cold weather the only mazut on hand was of low quality and contaminated with water. This would seem to be, at first glance, a rather weighty reason. But we are justified in asking, just where were you before, comrades? Why did you not take steps at the proper time to remove the water from the fuel? There was more than enough time to do this, because tanks were completely filled at the beginning of October, i.e. almost two months before the beginning of cold weather.

"We cannot convert to mazut," said a representative of the Ministry of Nonferrous Metallurgy Heavy Alloys Combine imeni Solovyev, throwing up his hands. "Our pump is not working."

Excuse me, but how then does one regard assurances by the enterprise's management that it was fully ready for work under winter conditions? Due to the indifference of combine managers equipment is put out of commission without having been in operation a single day.

This winter the workers of the Moscow Experimental High-Melting Metals and Hard Alloys Plant, also under the Ministry of Nonferrous Metallurgy, were among these negligent natural gas consumers as well. Here they refused to convert to liquid fuel on the grounds that mazut is allegedly "emergency fuel."

However, it was the workers at the Lyublinskoye Fruit and Vegetable Association who turned out to be some of the most careless. Investigation showed that the association is simply not set up to run equipment on mazut. Repeated statements by the management that repairs would be made on the mazut system in the near future got no farther than promises on paper.

The managers of the enterprises mentioned, those which did not carry out the instructions to convert to mazut, seem not to understand the difficulty of the situation in which they have placed city gas services. As a result of their indifference and lack of discipline the Mossovet Ispolkom was forced to request supplementary gas shipments to the city from the Ministry of the Gas Industry. In turn, this caused certain difficulties in the distribution of gas flows in trunk gas pipelines.

Was it possible to have gotten by without these special measures? Yes, of course. On the condition that all enterprises consuming energy should, without exception, strictly fulfill the demands made of them and approach matters of administrative discipline with greater responsibility.

However, by no means everywhere do operations managers and enterprise Party bureaus devote sufficient attention to educating collectives in the spirit of a thrifty attitude toward material resources, fuel and raw materials. The call sounded in Comrade K. U. Chernenko's speech at the CPSU Central Committee Politburo session on 15 November 1984 pledges us to monitor strictly the utilization of every cubic meter of natural gas, every liter of gasoline and every kilowatt-hour of electric power.

I will name specific cases of city transport enterprises where the situation does not look good with regard to matters of fuel economy. In November of last year a number of enterprises under the Ministry of Railways exceeded their natural gas consumption limit. Among these were the Likhobara Locomotive Depot, the Lyublinskoye Depot of the Moscow-Kursk Railroad Division and the rail car depot at Losinoostrovskaya Station. Several other city enterprises and organizations were also unable to keep within the established limits. I will name, for example, the USSR Ministry of Light Industry Mosshtamp Plant and Metrostroy Building and Installation Administration #9.

Punitive sanctions have been placed on all offenders, but even this is not the most important thing right now. It is felt that the "failing grade" given by winter for the insufficiency of preparation for the heating season should result in a serious analysis in CPSU rayon committees and the Party committees of the enterprises mentioned.

Questions of observing production routines for fuel consumption and the economical use of resources must be the object of increased attention on the part of organs of people's control and trade union and Komsomol organizations in these enterprises. In all probability it will be necessary to introduce the practice of making the index of fuel consumption a basic one in the presentation of the results of socialist competition. The search for new potential to increase savings of fuel energy resources will allow each enterprise not only to stay within established limits, but also to make its own mark in terms of fuel and energy economy, following the example of leading enterprises.

12825
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ENERGY CONSERVATION

LATVIAN ENERGY CHIEF AYZSILNIYEK ON CONSERVATION

Riga SOVETSKAYA LATVIYA in Russian 22 Dec 84 p 3

[Interview with I. Ya. Ayzsilniyek, Latvglavenergo director; conducted by P. Antropov on the occasion of 22 December, Power Engineers' Day: "Today Is Power Engineers' Day. Obligated to Be Thrifty"]

[Text] The concerns of the largest power engineers' collective in our republic are complex and diverse. This collective is the LaSSR Main Production Administration for Power Engineering and Electrification (Latvglavenergo). Its workers ensure the stable functioning of three hydroelectric power stations on the Daugava, the Riga TETs #1 and TETs #2, the Liepāja TETs, the Riga GRES and many thermal power centers, supply electric power and heat to almost one million customers, service approximately 100,000 kilometers of electric lines and hundreds of kilometers of thermal energy conduits and monitor consumption of electric and thermal energy.

The workers of Latvglavenergo are famed for their businesslike approach to their job; they skillfully and persistently, year after year, decrease the proportional share of fuel expended to produce electric and thermal energy. We have asked I. Ya. Ayzsilniyek, chief of Latvglavenergo, to tell us about power engineers' achievements and plans.

Ayzsilniyek: Our power engineers understand quite well the importance of a thrifty attitude toward electric and thermal energy, noted Indulis Yanovich. They know how much labor and capital go into its production. Our republic is not so rich in fuel and energy resources. Peat and the water power of the Daugava -- that's all. We are supplied with natural gas, mazut and coal by fraternal republics, where fuel reserves also have their limits. One should also take into account the fact that our electric power stations produce only one-half the quantity of electric power consumed in the republic. And the demands of the economy are steadily growing. In order to satisfy them better, we must conserve more.

This is why we are continually trying to reduce losses during the production of electric and thermal energy and in its transmission and utilization. For example, since the beginning of this five-year plan the proportional share of fuel per unit of electric power produced has decreased by almost eight percent and is now one of the lowest in the country. Much has been done in the current

year as well. Thus, as a result of a reduction in the proportional expenditure for electric power production we saved 11,300 tons of standard fuel, and an increase in transmission efficiency saved 13.5 million kilowatt-hours. This is a fine labor gift on the occasion of the holiday of our profession and a considerable contribution to the fulfillment of republic workers' socialist obligations.

[Question] What helps the Latvglavenergo collective confidently fulfill energy resource conservation assignments?

[Answer] Briefly, one should mention first of all the speeding up of scientific and technical progress and the inculcation in each worker of a feeling of responsibility for his assigned task. For example, at our hydroelectric and thermal electric power stations expenditures for the production of electric and thermal power are constantly being reduced as a result of the introduction of innovations. In the current year a great effect was had by the conversion of two boilers at TETs #2 to natural gas, which permitted a substantial reduction in mazut consumption and an increase in the effective output of equipment. Automation and remote control are finding ever greater application in power supply networks. In many places production, transmission and use schedules are calculated by computer; automatic equipment makes the necessary switches at the proper time. The installation of more modern transformer substations and lower-resistance networks also aids in conserving electric power. For example, more than 1,000 kilometers of such networks have been built this year. High-voltage lineman I. Mednis, foreman of the Riga Motorized Column Ya. Kasparson, Northern Electric Networks section chief A. Lokmanis, Daugava GES cascade engineer Ya. Tsirulis and other innovators made a substantial contribution to conservation savings through their suggestions.

[Question] What energy resource conservation tasks face power engineers over the coming year?

[Answer] The Party call to achieve above-plan savings received most enthusiastic support in our collective as it did throughout the country. According to our preliminary calculations, next year we will conserve a sufficient amount of fuel at thermal electric power stations to produce energy for two days. Our collective plans to save 34 million kilowatt-hours of electric power in transmission; that is twice as much as in the current year. To fulfill these tasks plans of action are being drawn up everywhere. They provide for a further increase in the efficiency of energy equipment, the building of power supply systems with greater transmission capacity and the introduction of innovators' suggestions. Two more boilers at TETs #2 will be converted to natural gas.

We are glad that all republic collectives will also accept the obligation to work two days on electric power saved through conservation.

[Question] How much electric power is needed to do this?

[Answer] Approximately 55 million kilowatt-hours. In order to produce them the Kegumskaya GES, for example, would have to operate at full capacity for 15 days. Nevertheless it is possible to conserve that much energy. The results

of fulfilling obligation in the preceeding years of the five-year plan and the results of monitoring energy consumption by a number of customers convince one of this. It is only necessary that not only power engineers should devote their attention to conservation matters, but managers of enterprises, designers, technologists and each worker as well. Of course, it is also good when enterprises are concerned about turning off machine tools and room lighting when they are not in use, but it is somewhat more important to speed up the introduction of energy-saving technologies. The Party teaches that today we must regard conservation not only as a supplement to resources, but as a basic source for ensuring production growth.

Indeed, a thrifty, creative approach to the job promises considerable gain. One does not have to look far to find evidence for this. For example, the introduction of a new technique for combining wires by twisting them together into cables at the VEF Association [Riga Order of Lenin State Electrotechnical Plant imeni V. I. Lenin] allows 600,000 kilowatt-hours of electric power to be saved each year. The Al'fa and Dzintars Production Associations, the Goldenayskiy Complex Timber Processing Combine, the Straume Plant, the Valmierskiy Bread Products Combine and a number of other enterprises are thoughtfully occupied with questions relating to the conservation of energy resources. It is quite to be expected that they should become the victors in the socialist competition to increase electric energy conservation.

[Question] But aren't there still those enterprises which just barely keep within their established electric power consumption limit?

[Answer] Worse than that, at times they exceed it. Thus, in December the workers of the Daugavpils Khimvolokno Association, the Kalntsiemskiy Building Materials Combine, the Ventspils Ventilator Plant and a number of other enterprises permitted excess energy consumption. One could wish for better fulfillment of obligations at enterprises under the Ministry of Motor Transport and Highways, the Ministry of Housing and Municipal Services and the Ministry of the Forest and Timber Industry. In these as well as other departments and collectives we must seriously analyze the reasons for shortcomings and take effective measures to increase resource conservation. Each of us can do a great deal to reduce unproductive losses of electric power and heat in municipal services and at home. There is a great potential here. For example, it has been determined that 20 percent of all electric power is used unnecessarily. Simply put, it is irrevocably lost. This means hundreds of millions of kilowatt-hours annually.

There is no excuse for such negligence. We are going to apply ever more strictly those rights which are granted to us in the struggle against the inefficient utilization of electric power. We are certain that power engineers in all sectors will support the efforts of Latvglavenergo workers. Our concerns are the same, and we are equally obligated to be thrifty.

12825
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GENERAL

TECHNICAL PROGRESS IN POWER MACHINEBUILDING DESCRIBED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 2, Feb 85 pp 3-11

[Article by V. Velichko, Ministry of Power Machine building: "Scientific and Technical Progress in the Branch"]

[Text] A rise in the technical and economic indicators of power-engineering equipment and an increase in its unit capacity are accompanied by high effectiveness in the national economy. Specifically, this is reflected in substantial growth in the generation of electricity and heat and in fuel savings at TES's.

Scientific and technical progress in power machinebuilding is opening up a possibility for reducing specific metals intensiveness of the output being produced, labor expenditures and the consumption of power, fuel and other material resources per unit of product manufactured. Therefore, the branch is interested in accelerating the development of models of new equipment and the perfecting of manufacturing processes, and that means of all production activity. Power machinebuilding had remained until recently the production of individual or small-series items, but now, with implementation of the USSR's Energy Program, increasingly large series of equipment are being required of it.

"The plan for the new year," noted K. U. Chernenko in a speech at the CPSU Central Committee Politburo session of 15 November 1984, "takes the true course for accelerating the output of a new generation of machinery and equipment and for increasing the equipment's reliability. It is the machinebuilders' duty to cope successfully with these difficult tasks."* The branch has practically been converted to the manufacture of basically new equipment for nuclear power, large thermal electric-power stations and compressor stations for trunk gas pipelines, as well as for the extractive branches of the national economy, ferrous metallurgy and others. As a result, the technical level and quality of the output produced will be raised considerably.

Simultaneously, the set of operations to increase the delivery of modules and complete sets of power-engineering equipment with a view to facilitating and accelerating their assembly at installation sites and to reduce the time required for putting them into operation, which, in turn, will prove to be of great ultimate benefit, is to continue. Thus the Belgorod Power Machinebuilding

*K. U. Chernenko. Conclude the Five-Year Plan in Worthy Fashion and Accelerate the Economy's Intensification. Moscow, Politizdat, 1984, page 6.

Plant imeni 60-Letiya SSSR is preparing to ship pipelines of high modularity, which are intended for AES's and thermal power stations.

The branch systematically and purposefully compares the equipment produced with the best domestic and foreign counterparts, with a view to making suggestions to designers. Decisions about the expediency of continuing to manufacture various models of equipment are made as a result of these studies. It is planned to take out of production during 1985 and later years several dozen specified obsolete items, and also to modernize various items of auxiliary boiler equipment.

In accordance with the CPSU Central Committee and USSR Council of Ministers Decree, "Measures for Speeding up Scientific and Technical Progress in the National Economy" (August 1983), Minenergomash [Ministry of Power Machine Building] has worked out a comprehensive program whose realization will enable all the branch's output to be brought up to the level of the best domestic and foreign models and to exceed them in certain indicators. It is planned to create in the near future several dozen units of basically new, large power-engineering equipment units. In so doing, it is planned that the annual share of items whose manufacture is being mastered for the first time will reach 17 percent of total commodity-output volume.

The branch's comprehensive program of scientific and technical progress calls for a further perfecting of the design and manufacturing technology of serially produced equipment with which power units for VVER-1000 [1,000-megawatt water-moderated water-cooled reactor] and RBMK-1500 [1,500-megawatt high-powered channel-type reactor] reactors will be equipped, the task of extending the operating life of this equipment 2-fold to 2.5-fold being first priority.

The ministry's enterprises and scientific-research organizations are combining their efforts with enterprises, scientific-research institutes and design bureaus of other branches of industry in the area of creating equipment for new nuclear-power units with which it is proposed to equip BN-800 type fast-neutron reactors and high-temperature gas-cooled reactors of the BGR and VTGR types. For the first time in world practice, the manufacture of equipment for serially produced power units for nuclear district-heating stations (AST's), whose use has started at Gorkiy and Voronezh, is to be organized.

The further economic and social development of Far North regions will depend in no small degree upon the stability of their power supply. A set of operations is to be effected that will result in the creation of low-capacity nuclear-power installations. Far North regions will obtain reliable modern equipment.

When producing new items, the power machinebuilders strive not only to improve their technical and economic indicators but also to consider the economic consequences of wide use thereof. That is why developers, in designing basically new boilers, search for ways to reduce their specific metals intensiveness and to reduce as much as possible discharges of nitrogen and sulfur, along with oxide stack gases, into the atmosphere. This is very important for all heat and power centrals, and especially for the Kansk-Acninsk and Ekibastuz coal fields, on the basis of which huge heat-and-power complexes are being built.

One of these practical routes is the use of boilers with fluidized-bed fireboxes. Their wide use is today viewed as being among the most important tasks

of heat and power engineering worldwide. Actually, all the industrially developed countries hav· national programs for solving this problem. Such great interest in it has been shown because the burning of fuel in a "fluidized bed" greatly reduces the amount of harmful discharges into the atmosphere and paves the way for the effective use of any type of fuel, something that is extremely difficult to do in traditional firebox installations. Based upon this, Minenergomash and USSR Minenergo have undertaken jointly to set up a comprehensive program for creating boilers with fluidized-bed fireboxes. This joining of creative potential on an interbranch basis will reduce the time for the new equipment to be brought up to the designed indicators.

It still cannot be considered that the fruitful idea of the fluidized bed has been studied with finality yet. Still deeper study and experimentation are required. Many people in the country are occupied with this matter to the fullest extent and in various directions. But efforts in this area, which is important to the national economy, still are dispersed. And, as a consequence, the benefit from the amounts invested is not great. It is desirable right now to coordinate, without superfluous debate or delays, the work of academic and industry's scientific-research institutes, as well as the work of vuzes, and to give them additional impetus, which will undoubtedly, on the whole, speed up solution of the problem, which is urgent for domestic power engineering.

The power machinebuilders have created new boilers with which TES power units of 200, 500 and 800 MW are to be equipped specially for the combustion of Kharanov, Kuznetsk and other low-grade coals, as well as of natural gas. Work is being done on them now so that these boilers will achieve stability of technical and economic indicators and high operating reliability.

In accordance with the USSR's Energy Program, methods for the more rational use of solid fuel, including those of eastern fields, are being applied. Already, specific engineering solutions with persuasive economic indicators have been proposed. Thus, Minenergomash enterprises have developed equipment for industrial test of a steam and gas installation (the PGU-250), with intracycle gasification of this fuel, which has a unit capacity of 250,000 kW. It can provide for economical combustion of solid fuel and for operation of equipment in a flexible mode. The PGU-250 can also be viewed as a model for more powerful units of similar type, opening up prospects for its wide use.

The Accountability Report of the CPSU Central Committee to the 26th Party Congress noted that the drive rod of economic policy will be matters which, it would seem, are simple and prosaic--an economical attitude toward the social good and consummate skill, and it is desirable to use all that we have. The CPSU Central Committee and USSR Council of Ministers Decree, "Intensification of the Work to Save and Make Rational Use of Raw-Material, Fuel, Power and Other Material Resources," was the realization of this important instruction. Among the set of urgent measures therein, it devotes attention to the necessity to insure the saving of secondary energy resources. In implementing the decisions of the 26th CPSU Congress, the Communist Party of the Soviet Union and the decree of the party and the government, Minenergomash, while creating a series of recovery boilers and power-engineering units for various branches of industry, chemicals, ferrous and nonferrous metallurgy and others, is continuing to take other measures to economize. The use of such boilers

and installations throughout the country as a whole will save about 2 million tons of standard fuel equivalent each year, redounding to high effectiveness for the national economy.

The branch's enterprises have turned over to an interagency commission a UPG-50/60 type installation, which is intended for injecting steam into oily formations. The wide use of such installations will provide for an increase in oil recovery and eliminate the need to buy similar equipment abroad. Two UPG-60/160 and two UPG 50/60 installations are to be produced in 1985. This, of course, will not satisfy the oilworkers' requirements, but it will pave the way for improving the quality of the installations, based upon the results of the first industrial operation, and for solving for the long term the problem of specializing its manufacture.

Each year the problem of processing solid city household waste becomes increasingly severe. The power machinebuilders have created a special boiler for burning trash. Such units had not been manufactured previously, and there was no experience in their design. The boiler, with a productivity of three tons of trash per hour, will, if required, be improved slowly, on the basis of operational experience, in order not to delay the organization of serial production.

Intensive research is being conducted into the possibility of the wide use of fuel shale, the reserves of which are substantial in the European part of the country, as a fuel for TES's. The branch's scientists and production workers are studying the design of a special boiler for a variable-load power unit with a unit capacity of 500,000 kW, whose fireboxes, it is proposed, will burn shale. This will increase the availability of power for the economy of the European part of the USSR.

At trunk gas pipeline compressor stations, the transportable "blue fuel" [natural gas] is being used for operating gas repumping units. The idea of raising the effectiveness of the equipment being used at the stations has arisen. Minenergomash, jointly with Mingazprom [Ministry of Gas Industry], Minsudprom [Ministry of Shipbuilding Industry] and USSR Minenergo plan to create for the Gryazovets compressor station within the next 2-3 years an experimental gas-and-steam installation based upon the GTN-25 gas-turbine unit. Calculations indicate that fuel utilization effectiveness at the compressor stations will be increased by 20-30 percent, and the annual economic benefit from introducing these gas-and-steam installations can reach 1.5 million rubles per station. This is a great advantage most of all to the national economy.

Change in methods for transporting solid fuel and a reduction in the distances for hauling it will produce a substantial saving not only for various industries but also for the country's economy as a whole. This matter, which is obvious in and of itself, is proving to be a far from easy matter in the first attempt to accomplish it. This is why enterprises and scientific-research organizations of Minenergomash have adopted the proposal of USSR Minenergo to provide creative forces and to organize industrial-test operation for assimilation of the technology of the burning of a water-and-coal suspension in power-engineering boilers. Success in this matter will enable the pipeline transport of coal to be introduced into power engineering.

Our modern domestic hydraulic turbinebuilding occupies a leading place in the world. In unit capacity, specific metals intensiveness, specific speed, efficiency, and certain other indicators, Soviet hydraulic turbines correspond on the whole to, and in some cases exceed, the parameters of the hydraulic units of leading foreign companies. This high engineering level is being constantly maintained both by further development of the experimental, testing and research base and by improvement in overall hydraulic turbine production.

The ministry's enterprises are creating equipment for hydroelectric-power stations that take account of the planned assimilation and the peculiarities of the hydropower resources of Siberia, the Far East and the republics of Transcaucasia and Central Asia, where hydroelectric stations are generating about a fourth of the total output of electricity. During the 11th Five-Year Plan highly economical hydraulic units were sent to the Shamkhorskaya, Dneprope-trovskaya, Kurpsayskaya and other GES's. The shipment of hydraulic-turbine runners for the Sayano-Shushenskaya GES has been completed. The dispatch of hydraulic turbines for the Nizhne-Kamskaya, Maynskaya, Kolymskaya and other hydropower stations is being completed.

All these are major technical achievements of the hydraulic turbinemakers. Along with supplying equipment for facilities due for early startup next year, they continue to labor also for the long term. In realizing the tasks of the USSR Energy Program, the hydraulic turbinebuilders have undertaken to prepare to produce bucket-type hydraulic turbines with unit capacities of 175,000 kW, which are intended for the Zaramagskaya GES, and radial-axial turbines of 153,000-kW unit capacity for the Kureyskaya GES. Active design work has been started on a radial-axial turbine of 340-MW capacity for the Boguchanskaya GES. Each of these will become a new technical achievement for Soviet hydraulic-turbinebuilders.

Adjustable-blade hydraulic turbines of 230,000-kW unit capacity, which were produced for the Shul'binskaya GES, are the world's largest for this class of hydraulic units. Meanwhile, the branch's specialists consider that even this high technical goal can be surpassed. Right now studies have been started, according to the results of which design work on hydraulic units of this type with a unit capacity of 400,000-450,000 kW will begin. This will raise considerably the effectiveness of those GES's at which the new machines will be installed.

The USSR Energy program calls for more complete use of all our nation's hydropower potential. The power machinebuilders have planned to create for this purpose a unified series of hydraulic turbines for small GES's so designed that their manufacture will not be labor intensive. Such an approach will provide for economy in producing them and high effectiveness for the consumer.

Minenergomash enterprises are executing the USSR Energy Program task that calls for the modernization of existing GES's, where the equipment has worked off its rated service life and needs to be replaced. At little capital investment, this operation will increase considerably the effectiveness of previously constructed hydropower stations, whose unit capacities will be increased with installation of the new hydraulic turbines, and operating costs will be reduced.

Each set of equipment for an electric-power station is, in essence, new technology, inasmuch as it is being improved, and perfecting of the manufacturing technology continues. The production association of the turbinebuilding Leningradskiy Metallcheskiy Zavod will begin the serial manufacture of high-speed steam turbines of 1 million-kW unit capacity for AES's, and it has shipped steam turbines of 800,000-kW unit capacity for the Permskaya GRES and Surgutskaya GRES No 2. These thermal machines, which are modern in design and in technical and economic indicators, have come up to their designed parameters, and are operating steadily, demonstrating high operating reliability.

Scientific and technical progress in power machinebuilding is actively manifested also in the updating of production technology, which will enable output quality to be controlled and manufacturing costs to be reduced. It is characteristic that the technology is being improved for practically all metallurgical-process stages. This means the introduction of highly effective sprayer quenching of turbine rotors and generators, heat treatment of forgings in furnaces with fiber lining, the quenching of blanks in polymeric water-solution mediums instead of in oil, and the production of precision-forged blanks for the blades and vanes of steam and gas turbines at automated forging complexes with screw presses of 2,300 and 5,000 ts [tons-force]. There are also the use of the technology of electron-beam and plasma deposition for flame-resistant coatings on blades and guide vanes and the substitution of welded ductile-metal turbine rotors and generators of seamless forged design, which reduces metal consumption during various manufacturing conversion processes 3-fold to 4-fold and cuts the cycle for manufacturing these products 2-fold to 2.5-fold.

For fruitful use of the newest technological processes and for attaining a high economic benefit, Minenergomash enterprises are replacing obsolete operating equipment with modern equipment that has numerical program control, and they are making wider use of machining centers. Various operations, primarily those that are labor intensive or monotonous, are being systematically automated and mechanized; robot use is being expanded, and the potential for creating flexible automated production facilities that take into account the branch's specifics, the large size of its basic equipment and the duration of the cycles for manufacturing it are being explored; and systems for automated design and preparation for the manufacturing processes are being applied.

Thus, one of the priority paths for improving existing production facilities--modernization--comprises a substantial portion of the renovation of these facilities. However, modern power machinebuilding, with the growing volume of product output, also needs newly created production capacity. The development of nuclear power has posed this task. It will be even more intense with the onset of the thermonuclear-power era.

The branch is constantly allocating no few funds for capital construction. And we are striving to assure that the planned capacity that the Production Associations Atommash imeni L. I. Brezhnev, Izhorskiy Zavod imeni A.A. Zhdanov and Krasnyy Kotel'shchik imeni 60-letiya Soyuza SSR and other enterprises are to introduce is created on time, regardless of objective difficulties. The branch does not need general capacity but complete units, so Minenergomash enterprises can send needed equipment on time to power stations that are under construction, primarily nuclear stations. The necessity for creating complete units of capacity is growing increasingly, because the flowline construction method is being used increasingly widely for erecting nuclear-power stations.

Special steelmaking, forging and pressworking facilities are to be developed under the branch's comprehensive program of scientific and technical progress, as a foundation for supporting the branch's stock and blanks base, and the Izhorskiy Zavod imeni A. A. Zhdanov Production Association has gained experience in manufacturing forgings from ingots that weigh 300 tons or more. Kramatorsk's Energomashspetsstal' Plant, jointly with Minelektrotekhprom [Ministry of Electrical Equipment Industry] and the Electrical-Welding Institute imeni Ye. O. Paton of the UkSSR Academy of Sciences, is creating an installation for electroslag batch pouring of ingots that weigh up to 200 tons. This fertile partnership will help to reduce the time spent designing and developing an installation, to accelerate its manufacture, to bring it up to the designed indicators, and to surmount more rapidly such a complicated obstacle as the numerous coordinations.

There are many positive instances of a practical approach to solving various problems. However, mutual understanding is not always achieved, despite the need to accelerate cooperation.

The European portion of the USSR has basically used equipment with a unit capacity of 300 and 800 MW, which operates in the base-load mode at TES's to satisfy the requirements of its developed industrial infrastructure for electricity and heat. The same mode is also specified for the nuclear-power stations being erected. The capacity of each of their power units will be, as a rule, 1 million kW, but 1.5 million kW at the Ignalinskaya AES. Meanwhile, power consumption here is extremely uneven: it rises sharply in the daytime, especially in the evening, but drops off at night. Such a situation necessitates the creation of special adjustable capacity, which is possible, thanks to the construction of pumped-storage, air-storage and gas-turbine electric-power stations, and also of high-capacity power units that burn fossil fuel in their fireboxes.

The Zagorskaya was among the first GAES's to be erected. However, a lag in its construction is delaying full-scale tests of the reversible hydraulic turbines that have been manufactured already, and their refinement later in accordance with operating results. It is extremely important to the power machinebuilders to get the necessary data directly from a GAES, since they are to manufacture a large series of this type of hydropower unit for the Kayshadorskaya, Tashlykskaya, Kanevskaya and other hydropower stations. The design and production technology improvements that will have to be introduced to bring all succeeding reversible hydraulic turbines up to a high technical level are not known yet.

The complicated situation in regard to creating a flexible semipeak-load 500-MW power unit that should operate on liquid fuel is much more complicated. Minenergomash developed the equipment for it 6 years ago. But it still has not been ordered, so there is no use in starting to build a power unit of this type. It would seem that it is desirable to speed up the solution of this problem, which is important to the national economy, since equipment created for a semipeak power unit can become obsolete.

At present, expanding use of the functional-cost method of analyzing the various types of products and technological processes poses the problems of radically improving and replacing them and also of consolidating partnership in this matter, which has been lacking in management practice. For example, the

Gomsel'mash Production Association has placed orders for complete sets of equipment for the KSK-100 combine at many of the country's enterprises, including power machinebuilding. Two of our associations (Sibenergomash and Leningradskiy Metallicheskiy Zavod), in guarding the state's interests, proposed, for purposes of reducing production expenditures, to improve the outfitting articles that they manufacture. However, the principal custodian of the technical documentation rejected the ideas of its partners. Such an attitude toward collaboration is not beneficial to the national economy, especially when it is considered that the combine showed low quality during operation.

In this connection, it is desirable to introduce a supplement to well-known GOST [All-Union State Standard] 15.001-73, which would require a functional-cost analysis of a technical request for placing an article in production. This will lead to a well thought out evaluation of the use of equipment that the various branches of the national economy use and it will also strengthen the partnership of client and producer. They will begin to define more precisely that which is more necessary to the consumer: the creation of a new article or modest modernization of that which is already being produced.

One of the important indicators of the effectiveness of the production-economics activity of the branch and of its technical level is the share of products awarded the State Emblem of Quality. But how is this output to be calculated? The question is not simple, especially for power machinebuilding, where, in the basic production, both the metallurgists output and the various spare parts, such as, for example, the rotors of steam turbines with a set of blades, nonstandardized equipment and some other articles, are not subject to certification. Meanwhile, during planning for the branch to manufacture articles with the State Emblem of Quality, its specifics are not considered, which puts the power machinebuilders in an unequal position with those branches where the whole product output or a large portion of it can be subject to certification. Economic practice suggests that it would be correct in the power machinebuilding field to evaluate the share of output with the State Emblem of Quality in the total volume of products subject to certification, or to include in the amount of output of products with the State Emblem of Quality that equipment that has the highest category of quality and a markup to the price for high effectiveness.

In order to realize the branch's comprehensive program for scientific and technical progress, successful execution of the social task of capital construction is important. This is especially important right now, when there are demographic complications. At present, general contractors do not always carry out plans for erecting industrial facilities, housing and social, cultural and personal-services facilities. This creates an additional strain on current production, which has been compelled to take upon itself a portion of the growing amounts of product output.

Constant purposefulness in performing promising scientific research and experimental design will provide each branch of industry with an engineering backlog of accomplished work, will raise the level of organization and technology of production, will help to put the branch into the ranks of the profitable industries, and will speed up scientific and technical progress in the national economy. This confirms experience in the country's economic development, primarily of the branches established in the postwar period.

Modern domestic nuclear power is posing new tasks for the power machinebuilders. They are to organize the production of higher-powered equipment for AES power units that have VVER reactors and to reduce their specific metals intensiveness from 0.99 kg/kW to 0.65 kg/kW. Substantial savings of metal will be achieved in the estimated annual volume of output of these items.

Promising developments include also the creation of new equipment for thermal power engineering, which formerly gave the national economy about three-fourths of all the electricity produced in the country. Thus, for purposes of more effective use of material resources, Minenergomash is organizing the design and manufacture of a boiler of reduced dimensions for power units of 800,000-kW unit capacity that will operate on natural gas. It is planned also to improve currently produced and new small-size boilers with productivities of 500 and 670 tons of steam per hour, one type of which is being operated successfully, specifically at Rostovskaya TETs-2.

The branch's scientific-research organizations and design-development offices have undertaken to solve technical problems associated with the creation of promising gas and steam installations of 800,000-kW unit capacity that will operate on gas. The first of them is to be installed at the Karmanovskaya and Lukoml'skaya GRES's.

At the Ryazanskaya GRES the erection of a basically new power unit--a magnetohydrodynamic generator with a unit capacity of 500,000 kW--continues. The power machinebuilders will send the boiler, combustion chamber and compressor for it in the near future. It is not excluded that the direct conversion of the high energy of gas into electricity can prove to be promsing.

During the whole period of the domestic development of heat engineering, as it was achieving ever higher technical goals and increases in the economy and operating reliability of GRES power units, it was being supplied with equipment of varied and more improved types. The time has come when a portion of it requires either replacement or modernization. And either is economically favorable for the national economy. The rated capacity of certain TES's is rising appreciably at comparatively small investment capital for renovation. This additional increase in capacity without the erection of new buildings and other TES structures will be a considerable contribution of the power machinebuilders and power engineers to fulfillment of goals to save resources.

Searches are being made continuously in the branch for reserves for raising the effectiveness of equipment created for TES's, by both designers and production workers. They have now combined their forces and have promoted wide research with a view to increasing the equipment's service life to 250,000 hours. This is a complicated task, but a realistic one.

The unevenness of electric-power consumption during the day has posed the problem of providing for the flexibility of power equipment at existing thermal stations. In 1984 Minenergomash, USSR Minenergo and Minelektrotekhprom undertook to jointly realize an integrated program that had been worked out for solving this important problem. The first stage called for increasing the flexibility of more than 100 power units of 100,000 kW to 800,000 kW of unit capacity, which will enable reductions in fluctuations of the load within power systems during drops in electrical consumption.

The power machinebuilders are also making long-range studies in the field of hydraulic turbinebuilding. In the near future, the industry's enterprises are to master the production of radial-axial hydraulic turbines with builtin shutoff that are unique in their combination of head and of unit capacity--309 meters and 615,000 kW, which are intended for the Rogunskaya GES. The economic benefit to the national economy from each unit's use will be 3.5 million rubles.

Radial-axial turbines with a unit capacity of 335,000 kW, which are to be assembled at the Bureyskaya Hydroelectric-Power Station, are being built specially for areas of Siberia and the Far East. The new flow section designed for it will enable several hundreds of tons of metal to be saved and an economic benefit of 1 million rubles to be obtained for each hydraulic turbine.

In the field of gas turbinebuilding, the branch's scientific-research organizations and enterprises have been engaged in the design development of effective systems for cooling the buckets and guide vanes of gas turbines. The use of such systems will enable the manufacture of the GTE-150 type gas-turbine installation of 150,000 kW unit capacity, with a turbine-entry temperature of 1,100 degrees Celsius for the working medium. This installation is to be produced in a transportable-module version, with a view to reducing installing work to a minimum at the place where it is to be used.

It is planned to start production during the next five-year plan of gas-repumping units that will create a pressure of 100 atmospheres. This will exceed by far the pipelines' throughput, and that means pipeline-transport effectiveness. Scientific and technical progress is going on in power machinebuilding in such fields as the creation of auxiliary boiler equipment, automation of the manufacture of most products, primarily those intended for power engineering and the compressor stations of trunk gas pipelines, and the further improvement of production technology. The branch is solving many organizational and technical problems by its own efforts. But some of them require a strengthening of partnership. This will aid successful fulfillment of plans for the national economy.

11409
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GENERAL

USE OF HEAT UNDERGROUND FOR ENERGY PURPOSES DISCUSSED

Kiev RABOCHAYA GAZETA in Russian 30 Dec 84 p 2

[Interview with Doctor of Geological Sciences Professor Bogdan Emmanuilovich Chekalyuk, chief of the Deep Hydrocarbon [*] Section of the Institute of Geology and Geochemistry of Useful Minerals of the UkSSR Academy of Sciences, by A. Kovtun (Lvov): "Today It Is a Fantasy, Tomorrow a Reality"]

[Text] Power-engineering development is a prerequisite to successful solution of all tasks of the national economy. It is precisely this principle and today's requirements that have helped to develop the Energy Program. This program can be compared in historical significance even with the GOELRO [State Commission for the Electrification of Russia] Plan, which was adopted more than half a century ago.

The current program covers practically all spheres of the national economy that are connected in one way or another with the generation and use of electricity. The intensive development not only of the power-engineering branches--coal, oil and gas--in particular, but also the use of non-traditional renewable sources--wind power and the earth's heat--are called for.

Staff workers of the Deep Hydrocarbon[*]Section of the Institute of Geology and the Chemistry of Fuel Minerals of the UkSSR Academy of Sciences are studying some of these problems. It is under B. E. Chekalyuk, Doctor of Geological Sciences and Professor. Our correspondent asked him to answer several questions.

[Question] You, Bogdan Emmanuilovich, have been occupied for almost half a century with a substantial portion of the problems connected with intensifying oil recovery. What changes have occurred in your work since adoption of the Energy Complex Program?

[Answer] The growing interest in our studies imposes a great responsibility on scientists and compels us to restructure our work. Two years ago the Laboratory for Comprehensive Problems of Oil Recovery was established in our

[*] [Text states 'uglevodov'(carbohydrate). Prob. should be 'uglevodorodov'].

section, which chemists and geophysicists joined. Thanks to this integrated approach, the effectiveness of developments has been raised.

We are performing research in two main directions, which supplement each other: improvement of oil-recovery methods and the creation of new technologies, and the development of new reserves. For example, there is the Kokhanovka oilfield in Lvov Oblast. About 15 years ago the recovery workers left there, confident that no raw materials remained. Now this field has been "discovered" for a second time. This concerns the so-called "nonstandardized" reserves, the amounts of which are substantial. Kokhanovka crude is heavier than water, has high viscosity and cannot be brought to the surface by traditional methods. It has to be dissolved in some way. Our institute's staff workers, as well as those of UkrNIIGiproneft' [Ukrainian Scientific-Research Institute for the Design of Oil-Industry Facilities], have developed a number of interesting technologies that will help to extract oil from the formations. One of these, which was proposed by K. A. Oganov and others, consists in subjecting this formation to heat treatment.

Thanks to steam-heat methods for treating the formation, tens of millions of additional tons of crude can be obtained at those fields that were once abandoned.

Of course, this requires somewhat greater labor expenditure than, for example, Samotlor does. But consider something else: expenditures for transporting Tyumen crude. Moreover, according to United Nations data, the reserves of this raw material, judging by the most optimistic estimates of scientists, are sufficient for decades.

[Question] And coal reserves--they are enough for more than 500 years? Has this not stimulated great interest in underground gasification of the solid fuel?

[Answer] This method was known back in Mendeleyev's time. Although only in recent decades has it been mentioned as a realistic reserve for power engineering. This refers, what is more, to reserves that are not up to standard. In every basin, there is almost as much of this coal as there is of coal that meets the standards.

The thick coal reserves, as is known, have already been worked out, basically. It has to be taken from thin and superthin formations. In the Lvov-Volyn basin alone, 1.2 billion tons of fuel cannot be taken with cutter-loaders. Moreover, not one of the known technologies, not even hydraulic mining, will permit the presence of people underground to be excluded completely. The essence of underground gasification consists in the coal being transformed directly underground into a mobile fuel--gas or liquid--which is mined conveniently through wells.

The technology has already been tested under bench-test conditions and we are convinced that it is advantageous, and soon we shall transfer all the work to a proving ground. According to preliminary computations, the effectiveness of fuel recovery will grow severalfold. The advantages of underground gasification are not just high effectiveness. The main thing is that this method will enable about 40 percent of the below-standard coal reserves to be included in the country's fuel balance.

During the next five-year plan our staff workers will test a small coal seam not far from Sokal. Then a gas pipeline will unite the Lvov-Volyn coal basin with the Dobrotvorskaya and Burshtynskaya GRES's. Gas obtained from coal will enter the pipeline. The plan seems like fantasy right now, but it is already in the second stage of fulfillment. One can speak realistically about it in regard to the Energy Program.

[Question] It is known that about 60 percent of the fossil fuel now extracted is consumed in generating electricity and heat. The basic purpose of the Energy Program is to reduce this share, and later to supplant petroleum products in general and then gas. Hopes are being vested in nuclear and thermonuclear power engineering and in nontraditional renewable energy sources. In particular, your section is busy with problems of using the deep heat of the earth. Tell us about this in more detail.

[Answer] Certainly you will recall from your school book that the temperature of the earth increases by 3 degrees for each 100 meters in depth. One can also use both the deep heat of dry rocks and so-called thermal water. As for these latter sources, there are already examples of them having been put to man's service. In the village of Ilinka in the Crimean Oblast, such an installation has been heating hothouses for 2 years. At the Sanatorium imeni Lenin, which is close to Sak, such water restores people's health. In the future, geothermal water will also be used in the microbiologicals industry, for heating communities, and so on. Designs have been created for geothermal electric-power stations. It is planned to build one of them in Transcarpathia, close to Beregovo. It can be represented schematically as a system of holes, a portion of which is intended for pumping water underground, and another portion for raising steam to the surface, where turbines and generators will have been installed. Exactly the same as GRES's nowadays. Each megawatt of GeoTES [geothermal electric-power station] capacity will save almost 3,500 tons of standard fuel equivalent per year. Not for nothing does the Energy Program say that at the second stage of its realization, the annual productivity of estimated energy resources, based upon standard fuel equivalent, will be 20-40 million tons. A substantial portion will be obtained from the use of solar and geothermal energy.

There are, of course, many problems here. There are as yet no engineering solutions of any kind. But still, nevertheless, I consider that even now one should think about the integrated use of geothermal water, both for sanatorium and resort treatments, and also for obtaining heat. Coordination is needed that would not only provide for the solution of various problems but would also unite scientists and practitioners, the representatives of various branches of the economy, and future consumers. If this is not done, a mass of difficulties will arise with the construction of GeoTES's, numerous other objects and other nontraditional power-engineering systems.

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